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THE COALS OF GOOSE CREEK AND ITS TRIBUTARIES

BY

JAMES M. HODGE

THE COALS OF GOOSE CREEK AND ITS TRIBUTARIES.

This report follows a recent examination in detail of practically all coal openings which were open to inspection on Goose creek and its tributaries in Clay and Knox counties.

A general review of the field is first presented, after which follow details of the coal openings visited, including correlations where practicable, and other comments as they appear pertinent.

The accompanying map gives the principal streams as recently surveyed by the State Geological Survey, the location and altitude above tide of most of the coal openings visited and of some of the principal points along Goose creek and Collins fork, the latter as determined by lines of levels by the same survey. With these levels for use as a base, heights of coal openings were determined by barometer, and are considered sufficiently accurate for use in this report, being much more so than when reliance had to be placed on topographical contours for basic heights.

The topography of the basin, as elsewhere in this coal field consists of narrow valleys enclosed by steep ridges with sharp summits, the hills varying in height generally from 400 to 800 feet above the valleys, the highest being in Kentucky ridge at the head of the creek. A reduction of average height and steepness from the east toward the west seems to have resulted from more rapid weathering westward, due to replacement of sandstone by shales in that direction.

The measures exposed above drainage include nearly 200 feet of the measures below the Manchester coal, on Little Goose creek, and probably about 1,000 feet of strata above the same coal on the upper part of Goose creek, the highest part being exposed in Kentucky ridge.

Though many of the streams have had their course determined by the dip of strata along them, such is not the case with many others. The prevailing dip in the section south from Manchester to Hammond fork of Collins fork and to Mill creek is southeastward, but the

whole region is greatly diversified with irregularities both in direction and amount of dip, making especially careful examination necessary for correct correlation of strata. The dip is generally very slight, rarely exceeding 3% and then only for very short distances.

The measures below the Manchester coal have normally a hard sandstone near the top with soft shales overlying that. Cliffs are formed where the streams break through this sandstone, and broad benches or even plateaus are prominent above them.

The sandstone under the Fire-clay coal, which, on streams northeast from Goose creek, is hard and cliff-forming in narrow ravines where the streams have but lately broken through it, like the hard sandstones under the Manchester coal, is softer on Goose creek waters and its identity therefore is much less easily established excepting through the coal beds of the locality.

The sandstone between the Haddix and Hazard beds retains its propensity for cliff-making, but in general is too closely associated with other hard sandstones for identification. In a number of places, however, the flatter topography immediately above it serves as an excellent guide in that respect. On the whole the sandstones afford little aid to correlation, and reliance for that must be based on the coal beds.

The principal coal beds of the region are given in descending order in the following general section, with the intervals between them as approximately ascertained:

Hindman Coal Bed.
Interval 100 to 150 feet.
Flag Coal Bed.
Interval 40 to 80 feet.
Hazard Coal Bed.
Interval 50 to 60 feet.
Haddix Coal Bed.
Interval 160 to 190 feet.
Fire-clay Coal Bed.
Interval 30 to 60 feet.
Whitesburg Coal Bed.
Interval 250 feet.
Howard Coal Bed.
Interval 250 feet.
Manchester Coal Bed.

There is above the Hindman bed (probably about 50 feet) another coal which may become of importance about the head of Goose creek, but as yet neither that bed nor the Hindman has been positively identified in the region covered by this report; the areas of both, large enough to consider workable, are confined to the high ridges of Mill creek and the streams above it.

THE FLAG COAL BED, with good areas extending considerably farther north and west, is of variable thickness and quality, notably in part cannel coal. The few openings where the coal could be seen to be of good thickness were too high in the hill to be attractive, but it is quite possible that the bed may have good areas of thick coal not yet discovered.

THE HAZARD COAL BED has fewer openings now uncovered than the Flag bed, and those that have been abandoned indicate generally a poor bed. The approximate location of the bed is often shown by the flatter topography, and usually at such places a point can be found where the bed may be opened with little difficulty.

THE HADDIX BED seems to be the most valuable of the higher ones, not only because of larger area, but apparently also because of usually workable, though variable, thickness. Its height in the series of strata renders it improbable that workable areas of the bed will be found farther north than the mouth of Otter creek.

THE FIRE-CLAY COAL BED (and its rider) where fully identified are not of workable thickness, but a bed with 3 to 4 feet of coal near the hill-tops at the head of Buzzard creek and on Hammond fork, with some good areas there, is tentatively ascribed to the Fire-clay coal horizon. Also, with some doubt as to correlation, is the 4-foot coal at the main head of Goose creek at the base of Kentucky ridge.

THE WHITESBURG BED, though found at a number of places, gives no satisfactory coal.

The following pages are devoted to a description in detail of the openings visited, with notes of other items which should aid in an understanding of the geology of the region.

The description is arranged in geographical sequence from Oneida, at the mouth of Goose creek to its head, each tributary and its branches on which coal was found being taken up as they are met in progress up the main creek. The terms left and right are used as when looking up stream.

Surface distances given in miles were mostly obtained from the map. Those given from Oneida and from Manchester as bases give the approximate distances following the principal bends in the creek, and are therefore in excess of the corresponding distances by road. Underground distances in yards are given as rough approximations only. Entries are called long which were carried beyond the range of the examination made.

Thickness of strata given in feet are approximations; when given in inches they may be relied upon as correct.

Altitudes, given in multiples of five, unless otherwise stated, were obtained by barometer, or, in cases of mouths of branches by interpolation from known altitudes where available and in some instances from estimation of the rates of fall of the stream into which the branches flow. Other altitudes were obtained by spirit leveling.

ONEIDA.

In Oneida, on the right of the road up Goose creek, Prof. J. A. Burns has a long entry into the Manchester bed, which, where measured 5 yards in, has 31 inches of coal under a shale roof. It is 45 feet above Goose creek and at altitude 772. About 150 yards farther west than the above, the coal is 32 inches thick 3 yards into the entry. Altitude 775.

Coal delivered at Onieda from some of the entries in the neighborhood is complained of as being slaty while from other entries it comes clean. The defect appears to be due to inclusion of slate from the roof and not to impurity of the bed itself, although there is too much

ash in the coal for a first class fuel. The following analysis of the coal, 33 inches thick, from an entry on Goose creek near Oneida, obtained from a private source, shows this, as well as a percentage of sulphur unusually high for this coal:

Manchester Bed.

Moisture	1.07
Volatile combustible matter	36.51
Fixed carbon	55.82
Ash	6.60
	100.00
Sulphur	2.65

A quarter-mile farther up the road, on the right, ⅛ mile up a right branch, Arch Roberts has 27 inches of coal under 10 feet of shale, the coal being measured 4 yards in a long entry. Altitude, as obtained, 790.

LICK BRANCH.

On the right, ½ mile from Oneida.

On the left, ½ mile up the branch, 10 feet above it, is a closed entry at altitude 785.

SHARPER BRANCH.

On the right, 1 mile from Oneida.

In the branch, ¼ mile up it, is a pit giving about 2½ feet of coal at altitude 770.

On a left branch of Goose creek, 1⅜ miles from Oneida, on the right, ⅛ mile up the branch, Squire Hensley has, under 10 feet of shale, coal varying from 27 to 30 inches in thickness at 3 yards into the entry. Its altitude is 765.

On the right of Goose creek and of the road, 1½ miles from Oneida, G. W. Hyden has an entry with coal 28 inches thick 2 yards in. Altitude 760. On the coal is 5 feet of shale and 10 feet above that is 20 feet of sandstone.

FURNACE BRANCH.

On the right, 2½ miles from Oneida. Altitude of mouth, 730.

A quarter-mile up this branch the Manchester coal has been taken from a pit in the branch at altitude 750. The top of the first cliff above the coal by the mouth of the branch is at altitude 835. The top of a second cliff, 965.

LAUREL BRANCH.

On the left, 3¼ miles from Oneida. Altitude of mouth, 735. The top of the first cliff above the Manchester coal appears to be about on the level of the forks of the branch, ⅜ mile up it, at altitude 805, and the Manchester coal itself beneath drainage here.

A quarter-mile up the right fork and ⅛ mile up a right hollow, William Bowling has the Fire-clay coal opened with the following section at the face of the entry, 6 yards in:

Fire-Clay Coal.

Massive sandstone	5 ft.
Coal	10″
Flint fire-clay	5″
Coal	18″

Altitude, 1225.

While from creek level the top of the first cliff above the Manchester coal seems clearly defined at the mouth of Furnace branch and along the creek on the left to the mouth of Laurel branch and up the latter, the top of the sandstone, after it is reached, shows such variation in level that measurement of altitude cannot be exact. Nevertheless it is, perhaps, as accurate as barometric observations permit, and a dip from Furnace branch to the forks of Laurel is evident.

Assuming that this dip, amounting to 30 feet as ascertained, continues to a point under the Fire-clay coal opening and allowing 15 feet additional pitch in that distance from the forks of Laurel, would put the top of the sandstone at altitude 790 and the Manchester coal,

90 feet lower, at altitude 700. The Fire-clay coal is then here about 525 feet above the Manchester coal.

On Hacker branch, a half-mile above Laurel branch, the top of the first cliff appears to be at altitude 800 at the forks of the branch, ¼ mile up it.

WILDCAT BRANCH.

On the right, 4½ miles above Oneida: Altitude of mouth, 740.

On the left, ¼ mile up and 5 feet above the branch, at altitude 755, is 5 inches of coal, which at an old opening 50 yards farther up is said to have increased to 30 inches. The exposed rocks there indicate the presence of but one bed of coal.

A half-mile up to the forks and ¼ mile up the right fork a pit in the branch is said to have yielded 30 inches of coal.

On the left fork, ¼ and ½ mile up, are pits at altitudes 785 and 805, also reported with 30 inches of coal. These give a rise up stream of 60 to 80 feet per mile. The bed is reported in the branch a mile up the left fork, of like thickness, and to continue to rise above the branch farther up. All of these are of the Manchester bed.

CONOLLEY BRANCH.

On the left, 6 miles from Oneida: Altitude of mouth, 745.

At Daniel Davidson's, ¾ mile up the branch, is 8 inches of coal at altitude 865. In the branch, ⅞ mile up, is said to be a foot of coal at altitude 915.

In the branch a mile up is about 16 inches of coal, under 4 feet of shale, at altitude 1105. These coals may be of the lower and upper splits of the Howard bed and of the Whitesburg bed.

On the right of Goose creek at low water level, 6⅞ miles from Oneida, the Manchester coal has been opened, said to be 2 feet thick, at altitude 745.

On the left, 7⅛ miles from Oneida, T. Spurlock has an entry, under good shale roof, with 24 inches of coal 10 yards in. Its altitude, 765, gives a considerable rise from the coal in the creek, but the inclination of the rocks in the creek bank opposite the mouth of Little Wildcat shows that such a dip is probable.

On the right, 7½ miles from Oneida, a closed entry at altitude 780 shows the up-stream rise of strata continuing but at a less rate. Four inches of iron ore, in shale, lies 25 feet under the coal here.

BEECH CREEK.

On the left, 8 miles above Oneida: Altitude of mouth, 752.

On the left, ⅛ mile up Beech creek, the Manchester coal shows 26 inches thick, under shale, at altitude 775.

LITTLE BEECH CREEK.

On the left one mile up.

A mile up to the forks of Little Beech, on the left ¼ mile up the right fork, F. Desarn has a 4-yard entry into 23 inches of coal, under black-jack roof, at altitude 900. The strata apparently dip but slightly from the mouth of the creek to this point, making this of the Howard bed, probably the lower split.

On the right, ¼ mile up a left branch, 4 miles up Beech creek, near Cedral postoffice, Jefferson Jones has a 5-yard entry into 41 inches of coal at branch level, altitude 935, analysis of which (No. G 3582) from my sample taken from the face, 5 yards in, is given on a following page.

The bottom 5 inches is very heavy, but is said to burn finely; that, along with nearly a foot more coal in the bottom block, becoming a poor cannel coal nearby as shown below. Eight inches from the top is 3 inches of coal inclined to be bony. The roof is shaly sandstone.

On the right, 4⅛ miles up, Thomas Gregory has a 30 yard entry into the same bed giving 40 inches of coal at the face, with 15 feet or more massive sandstone

covering. An earlier visit to the J. M. Jones adjacent opening gave the following bed section:

Shaly sandstone.
Shale ..... 2″
Coal ..... 10″
Shale ..... 2″
Coal ..... 22″
Cannel coal ..... 15″
Black slate ..... 3″
Shale ..... 6″
Altitude, 955.

Analyses of the cannel and bituminous coals made by Dr. R. Peter from my samples follow. Both give results unduly high in ash because of included mud, but the cannel sample evidently included also black slate from the bottom of the bed, to which the cannel changes by imperceptible degrees. It is evident from the appearance of the coal at the Jefferson Jones entry that but about 10 inches of the cannel should have been sampled for favorable results, but to leave the bottom 5 inches would be impracticable in mining. The high ash of the sample from the Jefferson Jones entry is undoubtedly due to the poorer quality of the lower 10 inches of the bed and to the bony coal higher up.

The recent Jefferson Jones coal analysis is given under Laboratory No. G 3582, the J. M. Jones cannel under No. 2652 and of bituminous coal under No. 2651.

	Analyses.		
Laboratory No.	G 3582.	G 2652.	G 2651.
Moisture	0.94	0.42	0 92
Volatile combustible matter	40.38	32.38	37.54
Fixed carbon	45.27	35.20	53.44
Ash	13.41	32.00	8.10
	100.00	100.00	100.00
Sulphur	3.23	6.042	1.601
Coke	rather dense	dense	spongy
Specific gravity			1.313
Color of ash	gray	brown	light brownish gray

At this locality coals were formerly found as shown below, but owing to a quite strong easterly dip showing here the intervals between them are not very reliable.

Coal	16″	1195
Coal		1140
Coal	12″	1010
Coal	47″	955
Coal	13″	910
Beech creek at Cedral		895

The lowest coal has 10 feet of shale above and below it; all the others sandstone roof.

The lower two coals are undoubtedly the two splits of the Howard bed (found on Hart branch) and the upper coal near to the Fire-clay coal bed.

From Cedral to the Hart creek gap, along the road to Manchester, benches and rock exposures both show a rapid rise, which carries the thick coal nearly to the gap level at altitude 1020. This gives a rate of rise of about 120 feet per mile southwest, while the greatest rate, nearly west must be considerably more. Below Cedral strata appear to lie nearly level.

LAUREL CREEK.

On the right, 9¼ miles from Oneida: Altitude of mouth, 756.

On the right, ½ mile up the creek, John Coldiron has a long entry into the Manchester bed, giving, under 5 feet of shale, about 28 inches of coal measured 3 yards underground. More coal is reported close below, but it was not apparent. Its altitude is 835.

On the left, ⅞ mile up, 50 yards above Skull branch, is an entry, under shale, having 41 inches of coal at the face, 25 yards in: Altitude 865. Under the fire-clay is 30 feet of sandstone, this differing from the strata under the opening next below Beech creek. Old openings, not noted, between the two make correlation unquestionable, and the rise of strata up Laurel here shown continues to the head of Rader creek.

On the right, one mile up Laurel creek, Joseph L. Hornsby has an entry into the Manchester bed with the following section at its mouth:

Shale	10 ft.
Coal	2″
Shale	2″
Coal	12″
Splint coal	34″
Black slate.	
Altitude, 855.	

At the face, 80 yards in, the coal is 41 inches thick, all fine looking block coal.

Anlyses, by Dr. Peter (No. 2650) follow of my sample, taken from 3 yards in, where the coal is 45 inches thick, with 3 inches parting 2 inches from the top, and of a sample by the Pittsburg Testing Laboratory Co., taken from where the coal is 45 inches thick without parting, as reported:

Manchester Bed.

Analyses.

	No. 2650	By P. T. L. Co.
Moisture	1.46	1.80
Volatile combustible matter	34.84	33.60
Fixed carbon	57.70	59.60
Ash	6.00	5.00
	100.00	100.00
Sulphur	0.531	1.14
Coke (spongy)	63.70	
Specific gravity	1.292	
Color of ash	nearly white.	

Dr. Peter remarked of the sample: "Apparently a good splint coal. No apparent pyrites, but some ferruginous stains; seems to be a somewhat weathered sample."

CHICKEN BRANCH.

On the left, 1¾ miles up Laurel creek: Altitude of mouth, 825.

On the left, ¾ mile up the branch, Mrs. Hounschell has a long entry at branch level, from which the following

section was obtained, the lower coal and parting being given as reliably reported:

Manchester Bed.

Shale	15 ft.
Coal	30″
Fire-clay	7″
Coal	13″

Altitude, 925.

A private analysis of a coal sample from the same bed, 30 inches thick, farther up Laurel creek is given below:

Manchester Bed.

Moisture	1.60
Volatile combustible matter	38.00
Fixed carbon	54 60
Ash	5.80
	100.00
Sulphur	1.64

On the left, 2⅛ miles up Laurel creek, James Barnett has a closed entry, at altitude 930, said to have 3 feet of coal.

ORCHARD BRANCH.

On the right, 2¼ miles up Laurel creek: Altitude of mouth 830.

On the left, ½ mile up the branch, John Howard has a closed entry into the Manchester bed at altitude 965, having apparently 2 to 2½ feet of coal.

COLLINS BRANCH.

On the right, 2⅜ miles up Laurel.

On the right fork, one mile from Laurel creek, a pit on the right of stream and road, at water level, altitude 935, gives 2 feet of coal under black slate with 20 feet of shale upon that.

On the left fork at about the same height and distance from Laurel creek are former openings now covered, all of the Manchester bed.

On the right, 2¾ miles up Laurel creek, Hannibal Morgan has a long entry at altitude 945, with coal 32 inches thick 11 yards in. Sandstone lies close below and black slate immediately above it.

At Washington Craft's, 3 miles up are two entries, one on the right at altitude 985 with about 28 inches of coal at its mouth, under 6 feet of shale; the other on the right of a left branch, at altitude 975, and 110 feet above the creek, also with shale roof.

On the right, 3¼ miles up, Daniel Baker has a long entry into this same Manchester bed with the following section, the coal face being measured 12 yards in:

Manchester Bed.

Shale	5 ft.
Black slate	6″
Coal	9″
Bone Coal	1″
Coal	17″

Altitude, 1005.

On the left, 3⅞ miles up, George Hall has a long entry with the following section at its mouth:

Manchester Bed.

Shale.	
Coal	4″
Shale	1″
Coal	31″

Altitude, 995.

FALLS BRANCH.

On the left, 4 miles up Laurel creek: Altitude of mouth, 890.

On the left, 1¼ miles up the branch, Elijah Campbell has a long entry into the Manchester bed at altitude 1020, and 25 feet above the branch. At 3 yards in the coal measures 35 inches, under shale roof.

A pit in the branch at its head, 1¾ miles up, gives the altitude of the bed there, 1055.

HOGSKIN BRANCH.

On the left, 4½ miles up Laurel.

On the left, 1¾ miles up the branch, a pit gives the Manchester bed at altitude 1085, the gap to Rader creek being at 1180.

On the left of Goose creek, 9½ miles from Oneida, an opening in the point of a hill shows the Manchester coal 26 inches thick, under 10 feet of shale, at altitude 815.

On the left, 9⅞ miles up, the bed is reported as having two seams of coal, each 2 feet thick, 4 feet apart, but the openings are now covered. No evidence having been seen of more than one bed in this vicinity it is more than likely that the current reports of two almost in contact are derived from the finding of the one bed in two adjacent places at slightly differing altitudes, a not uncommon occurrence in this region.

On the right, 10 miles from Oneida, in front of the Morgan house, the stain of the coal shows at altitude 835. Cannel coal is said to have come from a slip at 930 but no sign of coal remains there now.

On the left of a right branch, ⅛ mile up it and 11⅛ miles from Oneida, James Townsend has a 10-yard entry into the Manchester coal at altitude 890. At 4 yards in the coal is 26 inches thick; 30 feet of shale and sandstone overlie it.

On the right, 11⅜ miles from Oneida, an old opening shows the coal at altitude 855, while 30 feet below it is a bench which shows almost continuously and prominently from Laurel creek to Manchester.

JACKS CREEK.

On the right, 11¾ miles from Oneida.

On the right, ⅛ mile up the creek, the stain of the Manchester bed shows in the road at altitude 840. Thirty feet under this is an iron ore stain, corresponding with the ore under the opening next below Beech creek.

On the left, ½ mile up, are pits at altitude about 840, 20 feet above the creek.

On the left of a right branch, ½ mile up and ¼ mile up the branch, James Keith has a long entry, at altitude 845, with about 3 feet of coal. Private analysis of coal 37 inches thick, presumably from this entry gave the following results:

Manchester Bed.

Moisture	1.80
Volatile combustible matter	33.75
Fixed carbon	58.85
Ash	5.60
	100.00
Sulphur	0.80

These three Jacks creek coal altitudes show the bed nearly level in this vicinity, but those farther up show a rapid rise. On the left, 1¼ miles up, a closed entry at altitude 865 is said to have coal 28 inches thick.

On the left, 1⅞ miles up, an old stripping lies at altitude 915.

On the right, 2 miles up, is an old stripping with coal, said to be 26 inches thick, at altitude 925. Forty feet or more of shale lies on this coal, as evidenced on the road over the divide to Island creek.

The clearly defined benches along Jacks creek, 70 and 100 feet, approximately, above the coal are especially to be noted, as they appear elsewhere over it, though nowhere so distinct. Here the lower one is most prominent, but on Island creek and especially on Little Goose creek, where it becomes the principal bench, the upper one is more conspicuous.

On the right, by the road up Goose creek, 12½ miles from Oneida, and again 12¾ miles, black shale appears at altitude 785, under heavy sandstone and about 70 feet below the place of the Manchester coal as judged by the plateau-like bench formed by the sandstone at the top of the conglomerate formation.

On the left, 13⅛ miles from Oneida, an old opening into the Manchester bed shows about 70 feet above the creek, at altitude 860.

On the right, 13⅜ miles above Oneida (⅛ mile above the oil-pump station) a closed entry under 15 feet of shale is at altitude 820.

On the left, 13¾ miles from Oneida, is a long entry into the Manchester bed with coal increasing from 51 to 53 inches at 5 to 15 yards in. Water in the entry prevented following farther; the maximum is reported 56 inches. Its altitude at its mouth is 795 and it dips in going in quite rapidly to the east.

A private analysis with coal given as 54½ inches, including ½ inch of bone coal in the middle, gives results as follows: (A.)

On the left, 14 miles from Oneida is a prospect, 5 feet above the creek, with coal, by the same authority, 33 inches thick and analysis as follows: (B.)

Manchester Bed.

	A.	B.
Moisture	1.44	7.00
Volatile combustible matter	35.50	34.40
Fixed carbon	55.54	50.30
Ash	7.52	8.30
	100.00	100.00
Sulphur	0.81	0.60

Comparison of altitudes of the Manchester bed shows a quite rapid dip to this point from down stream and up also, accounting for the sharp bend in the creek here. That this dip continues eastward to Beech creek is evidenced by the fact that the Manchester coal at Cedral is at a much lower altitude, estimated about 700.

On the left, 14½ miles from Oneida, on the late N. Cotton farm, old strippings show the bed at altitude 820.

On the right, 15 miles from Oneida, a closed entry shows the bed at altitude 835. A quarter mile farther up, black shale about 70 feet under the coal emerges from the creek at altitude 775; thence to Bolling branch it shows a gradual rise.

On the left, 15⅜ miles from Oneida, at Napoleon Cotton's, a cliff by the creek gives the following section:

	Feet	
Massive sandstone	3	0″
Sandy shale	12	0″
Coal		5″
Covered	5	0″
Thin bedded sandstone to creek	5	0″

Altitude, 785.

This coal is probably about 100 feet below the Manchester bed.

BOLLING BRANCH.

On the right, 15½ mlies from Oneida: Altitude of mouth, 775.

On the left, along the road for 100 yards up this branch, black shale shows with a strong southeast dip at altitudes 825 to 840. The strata are supposed to lie in a small wave here with the crest near where the shale disappears at altitude 840.

On the right, ¼ mile up, are closed pits into the Manchester bed at altitude 885.

On the right, ½ mile up, E. B. Treadway has a 3-yard entry, under 4 feet of shale, with 35 inches of coal at its mouth: It is 10 feet higher than the branch, and at altitude 890.

On the left, 15¾ miles from Oneida, an old prospect gives the Machester bed at altitude 915. This is higher than surrounding openings into the same bed and the uplift of strata at this point gives cause for the long western bend of Goose creek to the mouth of Island creek.

ISLAND CREEK.

On the right of Goose creek, 16¼ miles from Oneida: Altitude of mouth, 780.

Black and yellow shales belonging some 20 feet under the Manchester coal cover the long spur at the

school house on the right at the mouth of the creek, the altitude there being 900. Under these is the sandstone which, particularly conspicuous on Island creek and neighboring streams and at Manchester, provides the base for a considerable plateau, the streams having cut down through it into narrow gorges, usually short and not deep.

On the left, at the ford, ½ mile up, the black shale 70 feet under the coal, appears in the road at altitude 820.

On the left, ¾ mile up the creek, ¼ mile from it, opposite the head of Needmore branch, the Manchester coal has been taken from a pit at altitude 900.

The creek forks about 1½ miles up at altitude 830.

RIGHT FORK.

On the right, ½ mile up, at David Roark's, is 6 inches of coal under 5 feet of shale and on 3 feet of rough sandstone, at altitude 895, five feet above the creek. The coal is probably an offshoot from the Manchester bed.

On the left of a right branch there, ⅛ mile up it, Mr. Roark has a new opening into the Manchester bed with coal 26 inches thick and earth cover, at altitude 945. Allowing 20 feet for dip between these two coals brings them 20 feet apart.

On the right, ¾ mile up the fork, is an old stripping at altitude 975.

On the left, 1¼ miles up, on the road to the head of Jacks creek, a closed entry gives the Manchester bed at altitude 985.

LEFT FORK.

On the left, ¾ (?) mile up, Jones and Keith have a stripping, close above the cliff sandstone, with 26 inches of coal at altitude 955, 50 feet above the creek.

On the right of Goose creek, 16¾ miles above Oneida, George Robinson has strippings into the Manchester bed at altitude 875.

On a left branch, 18¼ miles from Oneida, on the right, ⅛ mile up the branch, at the back door of Harvey

Cotton's house, is his entry into coal 23 inches thick at the face 4 yards in. Fifteen feet of shale overlie the bed, which here is at altitude 875.

HART BRANCH.

On the left, 18¾ miles from Oneida: Altitude of mouth, 790.

In Hart branch, ¼ mile up it, at the mouth of the branch heading near Manchester, the black shale under the Manchester coal shows at altitude 805.

On the same little branch, ⅛ mile up it, and in the road to Manchester, the stain of the Manchester coal is at altitude 870.

COAL HOLLOW.

On the right, ⅝ mile up Hart Branch.

On the right, ¼ mile up, a closed entry, 5 feet above the branch, gives the Manchester coal at 875.

On the right, ¾ mile up Hart branch, is a stripping of the same bed with coal 24 inches thick and altitude 865.

A slight dip up stream carries that bed to about altitude 840 at the mouth of the branch leading to Beech creek, 1¼ miles up Hart branch.

On the right of that left branch, ¼ mile up it, a thin coal under 5 feet of shale has been opened at altitude 980; the lower split of the Howard bed.

On the left, ⅜ mile up this branch, Mrs. Patrick has an 8-yard entry giving the following section:

Sandstone	4 ft.
Coal	12″
Bituminous shale	3″
Coal	11″
Black slate.	
Altitude, 1020.	

The bed is said to be 3 feet thick at the face of the entry.

It is undoubtedly of the same Howard bed as the Jones entry of Beech creek, though 65 feet higher, giving a northeasterly dip of over 80 feet to the mile.

The same bed is opened on the right, 2¼ miles up Hart branch, in a 15-yard entry giving the following section, the coal measured 3 yards in:

Massive sandstone....10 ft.
Shaly sandstone ..... 1 ft.
Coal .....16″
Bituminous shale .... 6″
Coal .....10″
Altitude, 1080.

The strata appear to lie nearly level up from the mouth of the branch to Beech creek, this coal being then here 200 to 250 feet above the Manchester coal.

On the right of Goose creek, 19 miles from Oneida, the Manchester coal has been stripped, with thickness reported 24 to 26 inches, at altitude 915.

NEEDMORE BRANCH.

On the right 19½ miles from Oneida: Altitude of mouth, 790.

On the right, ¼ mile up the branch, C. D. Lyttle has a long entry, giving 24 inches of coal, 3 yards in, under shale, at altitude 885. A ledge of sandstone 35 feet thick lies 20 feet under it, and black shale, in the road, 70 feet under, altitude 815.

On the right, ⅜ mile up, the coal has been opened at altitude 890, and again, ½ mile up, at 875.

On the left, ¾ mile up, a long entry has 27 inches of coal 5 yards in, at altitude 880.

A private analysis of coal, 30 inches thick from this branch, is reported with the following results:

Manchester Bed.

Moisture	1.50
Volatile combustible matter	34.20
Fixed carbon	57.60
Ash	6.70
	100 00
Sulphur	1.95

LITTLE GOOSE CREEK.

On the right, 20 miles from Oneida: Altitude of mouth, 792.

GREENBRIER BRANCH.

On the right, ½ mile up Little Goose creek: Altitude of mouth, 795.

On the right, a mile up this branch, is a stripping of the Manchester bed at altitude 950, and again, 1¼ miles up, the latter with 25 inches of coal under 8 feet of shale, at altitude 960.

STONE COAL BRANCH.

On the right, 2 miles up Little Goose creek: Altitude of mouth, 810.

On the left, and left of road to Manchester, ¼ mile up the branch, an old opening shows the Manchester bed at altitude 890.

On the right, ¼ mile up, is 2 feet of black shale under a sandstone ledge, as on Island creek and Needmore branch, at altitude 850. In the branch, farther up, this shale shows again, rising to altitude 860 before it disappears.

On the left, ⅜ mile up, is an old opening into the Manchester bed at altitude 910, and on the right, ½ mile up, another at the same height.

On the left, ⅝ mile up, a pit in the branch gives the bed at altitude 915. These three openings are on S. B. Caudill's land.

Benches appear on this branch about 50, 75 and 95 feet above the coal.

On the right of a right branch, by the road to Ephraim creek, ¾ mile from Little Goose creek, S. A. Asher has a 3-yard entry into the same bed, with covering differing from those heretofore given, the section being:

Manchester Bed.

Sandstone.	
Clay	1″
Shale	6″
Coal	33″

Altitude, 940.

On the left of Little Goose creek, 3⅜ miles up it, Edward Garrison has a stripping into the same bed with 15 feet of shale, much of it black, over the hidden coal. Its altitude is 910.

ROARK (OR SHED) BRANCH.

On the right, 3⅜ miles up Little Goose creek: Altitude of mouth, 830.

On the left, ¼ mile up this branch, John Garrison has a stripping on coal of the Manchester bed, 30 inches thick with 8 feet of shale, part black, exposed above the coal at altitude 950.

By the road at the mouth of the branch is shale, part black, at altitude 840 to 870. Most of this shale appears to have replaced in part the sandstone along Goose creek, a change which seems to prevail to a large extent in going westward from that stream.

RADER CREEK.

On the right of Little Goose creek, 3½ miles up it: Altitude of mouth, 830.

On the right, ¼ mile up, Mrs. Lucy Ledford has a closed pit into the Manchester bed at altitude 980.

On a left branch, ½ mile up Rader creek, on the right ¼ mile up the branch, the Cotton heirs have a long entry into the same bed, with 30 inches of coal 5 yards in, at altitude 1035.

On the right, ½ mile up the branch, the coal is also 30 inches thick at the face of a 4-yard entry, at altitude 1055.

SPICE GAP BRANCH.—On the left, 1¾ miles up Rader creek: Altitude of mouth, 925.

On the right, ½ mile up, is a long entry into the Manchester bed with 35 inches of coal 12 yards in. Its altitude is 1045.

By William Ponder's mill, on the right, 1⅞ miles up Rader creek, the same bed has 32 inches of coal at the face of a 15-yard entry at altitude 1020.

RICH HOLLOW.—On the right, 2 miles up Rader creek.

On the left, ¼ mile up the hollow, William Ponder has a long entry into the Manchester bed with 30 inches of coal 5 yards in, under 5 feet of shale. Its altitude is 1035.

On the right, at Sidell postoffice, 2½ miles up Rader creek, James M. Baker has a 12-yard entry under shale into the same bed with 30 inches of coal at the face, at altitude 1030, 50 feet above the creek.

SANDLIN BRANCH.—On the right, 3 miles up Rader creek: Altitude of mouth, 1000.

At William Sandlin's, ½ mile up the branch, and in it, under 8 feet of shale, is a pit with Manchester coal said to be 30 inches thick, altitude 1070.

At John Gibson's, 3⅜ miles up Rader creek, on the left, ¼ mile up a left branch, is the same bed opened in a pit with coal reported 2 feet thick, at altitude 1080.

On the left, at Tip Barron's mill, 4 miles up the creek, it is again reported 2 feet thick; its altitude not taken.

On the right, 4¼ miles up Rader creek, James Lewis has a pit into the same bed at altitude 1090.

On the left, by the road, 4½ miles up the creek, Noah Resner has an opening into the same bed with 22 inches of coal, at altitude 1100.

Again it is opened in a pit in the creek, at its head, 4¾ miles up, at altitude 1100.

EPHRAIM BRANCH.

On the left of Little Goose creek, 4⅛ miles up it: Altitude of mouth, 840.

WALL BRANCH.—On the right, ¾ mile up Ephraim branch.

On the right, ⅜ mile up this branch, B. J. Finley has pits into the Manchester coal, said to be 2½ to 3 feet thick, at altitude 980.

Ephraim branch forks, ½ mile up: On the left of the right fork, ¼ mile up it, by the road, is an old entry into the same bed, at altitude 980.

The bed is opened again in a pit at Linda Smallwood's, ½ mile up, and in the right fork, with a foot of coal showing when visited, and probably 1½ feet more coal which was covered with mud. Its altitude is 985.

HOOKER BRANCH.

On the left, 4⅜ miles up Little Goose creek: Altitude of mouth, 845.

At M. V. Craft's, ¾ mile up Hooker branch, the Manchester coal, under 8 feet of shale, has been opened, 26 inches thick, at altitude 1015.

At Jasper Munsey's, 1⅜ miles up Hooker branch, on the right, ⅛ mile up a left branch, the same bed is opened in a 13-yard entry, under good shale roof, with 25 inches of coal at its mouth and face, at altitude 1015.

The principal bench of this vicinity lies 105 feet over this coal, at altitude 1120, and coal is reported at altitude 1175.

Hooker branch forks 1¾ miles up; on the left nearly at its level, ⅛ mile up the left fork, the Manchester bed is opened in a pit at altitude 995.

On the head of the right fork, ¼ mile up it, the bed has been opened at altitude 1010, with yellow shale 10 feet below it.

GRAY FORK.

On the right, 6¼ miles up Little Goose creek: Altitude of mouth, 870.

From the bed of this stream, ⅛ mile up it, coal has been taken having a thickness of not more than 1½ feet, if the rock at the bottom of the hole left is the limit of thickness of the coal bed and not a parting. The coal lies at altitude 875 about 185 feet below the Manchester bed, and is below drainage everywhere else on Goose creek waters. It has about a foot of hard black slate roof.

ROGERS BRANCH.—On the right, ¼ mile up Gray fork. On the right, at U. S. Eagle's, ¼ mile up the branch, the Manchester bed has been opened, under shale, with about 27 inches of coal, at altitude 1070.

In the road, ⅜ mile up Gray fork, is 6 inches of coal stain at altitude 900. Enclosed in sandstone it is quite likely not to be of a continuous bed.

On the right branch, ¾ mile up Gray fork, on the left, ¼ mile up the branch, George Thomas has a wet entry, under 5 feet of shale, with coal 29 inches thick at its mouth, and a second entry beside it with about 34 inches of coal. These are in the Manchester bed at altitude 1060.

TINKERS BRANCH.—On the right, 1 mile up Gray fork. On the right, ¼ mile up the branch, Henry Hounschell has a long entry into the Manchester bed, with 31 inches of coal, at altitude 1095. A private analysis of this coal, given as 30 inches thick, is reported with the following results:

Manchester Bed.

Moisture	1.40
Volatile combustible matter	33.80
Fixed carbon	59.00
Ash	5.80
	100.00
Sulphur	0.47

DRY BRANCH.—On the right, 2 miles up Gray fork. On the right, ¼ mile up this branch, George Potter has an entry with the following section, the coal measured at the face, 12 yards in:

Manchester Bed.

Sandstone	5 ft.
Shale	10 ft.
Coal	22″

Altitude, 1110.

At the forks, 3 miles up Gray fork, the altitude is 990.

A quarter mile up the right fork is Wells branch on the right, and a mile up the branch is Wyatt's opening,

on the left at the head of the branch. The coal here is 20 inches thick, under 8 feet of shale, at altitude 1240. Apparently this coal is somewhat over 100 feet above the Manchester bed, but there was nothing definite found in the vicinity to aid in fixing its position. It seems to correspond with thin coal found on Goose creek, ⅛ mile above Collins fork.

KINKEAD BRANCH.

On the right, 7 miles up Little Goose creek: Altitude of mouth, 890.

On the right, ¼ mile up this branch, Mrs. Nancy J. Hibbard has a long entry into the Manchester bed, under good shale roof, with coal 32 inches thick 10 yards in. Its altitude is 1060.

A half-mile up to the Road fork, and ¾ mile up it, is a right branch. In this branch, ¼ mile up it, Hopper Bolling has pits 3 feet or more deep, with cannel coal reported 4 feet thick. Blocks of the cannel 10 inches thick were seen, apparently very good in quality, but said to be explosive. It also is of the Manchester bed at altitude 1060.

On the right, 1½ miles up the Road fork, and at its level, is the Benge long entry with about 40 inches of coal, under a bad shale roof, at altitude 1110. Following is a section of the bed and analysis of the coal, not including the cannel, as obtained from a private source:

Manchester Bed.

Coal	28″
Parting	1″
Coal	6″
Cannel coal	4″

Analysis.

Moisture	2.10
Volatile combustible matter	35.45
Fixed carbon	57.21
Ash	5.24
	100.00
Sulphur	1.15

On the left of Little Goose creek, 7¼ miles up it, at Timothy Young's, on the left, ⅛ mile up a left branch, an abandonded entry gives the Manchester coal about 28 inches thick, at altitude 990.

PHILPOT FORK.

On the left of Little Goose creek, 8 miles up it: Altitude of mouth, 910.

At the head of a left branch, ⅛ mile up Philpot fork, and ⅛ mile up the branch, R. T. Hayre has a 10-yard entry into the Manchester coal, 39 inches thick half way in, at altitude 1000. The roof is of sandstone, slightly shaly, showing 10 feet thick. In about 50 feet distance the coal rises southward nearly 10 feet; a continuous rise is not apparent.

On the right, one mile up the fork, at Urban post-office, Thomas Hayre has two long entries, under 5 feet of shale, with coal 30 inches thick at the mouth of the one open to measurement. The roof, soft at the mouth, seems to be fairly hard inside. These entries are of the Manchester bed at altitude 1070, 130 feet above the fork.

On the left of a right branch, 2 miles up Philpot fork, ¼ mile up the branch, Granville Philpot has a long entry into the same bed, under shale, with 33 inches of coal at its mouth. The coal is said to vary in thickness from 30 to 36 inches. Its altitude is 1060, 80 feet above the fork.

On the left, 2½ miles up the fork, on the road to main Little Goose creek, William Longworth has an entry into the same bed, under shale, with 37 inches of coal 8 yards in, 30 inches 12 yards in, and thence to the face, 35 yards in, 33 inches. It is 25 feet above the fork, at altitude 1045.

From a private report the following is given of coal on Minton branch doubtless of the same bed:

Coal	11″
Parting	2″
Coal	32″

Analysis.

Moisture	1.32
Volatile combustible matter	37.66
Fixed carbon	55.52
Ash	5.50
	100.00
Sulphur	2.25

ROCK GAP BRANCH.

On the left of Little Goose creek, 9 miles up it: Altitude of mouth, 950.

On the left, ¼ mile up the branch, Irvine Hoskins has an 8-yard entry into the Manchester coal 32 inches thick at the face. Upon it is 5 feet of shale and black shale lies 75 feet below it. Its altitude is 1075.

Mr. Hoskins has also an abandoned entry into the same bed on the right, 9¼ miles up Little Goose creek. Altitude not taken.

BROCK BRANCH.

On the left, 9¾ miles up Little Goose creek: Altitude of mouth, 980.

The Ponder abandoned entry, on the left, ¼ mile up the branch, is said to have a maximum thickness of 36 to 38 inches.

The Fisher entry on the right, ⅜ mile up, has 25 inches of coal at its face, 8 yards in.

A new Fisher stripping on the left, ½ mile up, gives 31 inches of coal under 4 feet of shale.

These three openings are of the Manchester bed at altitude 1080.

On the right, by the road, 10¼ miles up Little Goose creek, 10 feet above it, at altitude 1015, is 5 inches of coal under 5 feet of shaly and honeycomb sandstone and upon 5 feet of fire-clay. This coal, not seen elsewhere, unless near the head of Horse creek, is probably in the place of the usual black shale 70 feet under the Manchester bed, and not continuous.

MANCHESTER.

The formation below the Manchester coal, which has been clearly apparent over much of the region from Beech creek to this point, here makes its last appearance with characteristic cliffs, though the topography above the Collins fork is somewhat indicative of it. The black shale which lies about 70 feet below its top, noted on Stone Coal branch, is cut out by sandstone in the town, its place apparently indicated by the flat upon which the principal stores are built, the courthouse being upon the top of the formation at altitude 909, 114 feet above Goose creek.

On the right, ¼ mile up the left branch with mouth at the town ford, the Lucas heirs have a long entry into the Manchester bed with coal 27 inches thick at its mouth and altitude 885.

On the left of the town branch, opposite the Webb Hotel, J. A. Webb has an abandoned opening, said to have 2 feet of coal, at altitude 910.

Other openings on this branch show it to rise regularly to an abandoned one on the right, ¾ mile up, at altitude 930, with benches on the left, somewhat indistinct, where noted, 70 feet above the coal, but plain 100 feet above it.

At the upper end of Manchester, on the left, ⅛ mile up a right branch of Goose creek, Peter Halsey has an entry into the Manchester bed, under shale, with 17 inches of coal at the face 6 yards in. Altitude 885.

TANYARD BRANCH.

On the left, ¼ mile above the center of Manchester: Altitude of mouth, 795.

On the right, ¼ mile up the branch, an old pit gives the altitude of the same bed 845.

HORSE CREEK.

On the right, 1½ miles up Goose creek from Manchester: Altitude of mouth, 800.

MUDDY GAP BRANCH.

On the right of Horse creek, ¼ mile up it: Altitude of mouth, 805.

The Manchester bed lies above the sandstone which shows along the branch near its mouth, its altitude there being about 860.

At Samuel Howe's, on the right, ¾ mile up the branch, is a 45-yard entry under black shale, with 32 inches of coal 16 yards in. The entry rises rapidly northeastward. Its altitude at the mouth is 875.

On the right, 1 mile up the branch, a long entry under black shale gives the same bed, with 24 inches of coal at its mouth, at altitude 895.

On the left, 100 yards farther up, James Hyde has a long entry into the same bed, with 29 inches of coal 6 yards in, under shale, at altitude 880.

On the right, 1¼ miles up Horse creek, is a long entry into the Manchester bed, in the point of a hill, with 28 inches of coal 8 yards in, and altitude 845.

At William Horton's, 1⅞ miles up the creek, on the right, ⅛ mile up a right branch, a stripping gives the same bed, under 10 feet of shale, 39 inches of coal, at altitude 855.

CRAWFISH BRANCH.

On the left, 2 miles up Horse creek: Altitude of mouth, 820.

On the left, ½ mile up the branch, 10 feet above it, an abandoned entry gives the Manchester bed at altitude 860, while 100 yards farther up it has been opened at altitude 880.

This sharp rise is not continuous, however, for a mile up the branch a pit in it gives the bed at altitude 875.

At 1½ miles up, on the right of a left hollow, a thin coal under brown and black shale has been opened at altitude 990, probably about 100 feet above the Manchester bed.

On the left, 2½ miles up Horse creek, Moses Lewis has a stripping of the Manchester bed about 38 inches thick, the lower half buried in mud when visited, but presumably all coal. Its altitude is 865.

On the right, 2⅝ miles up, Daniel Sibert has a 5-yard entry into the same bed with 44 inches of coal at its mouth. Altitude, 860.

PAWPAW BRANCH.

On the right, 2¾ miles up Horse creek: Altitude of mouth, 830.

On the left, ¼ mile up the branch, Thomas Sibert has a long entry into the Manchester bed with coal 37, 39 and 36 inches thick at 5, 10 and 30 yards, respectively, from the mouth. Its altitude is 880.

YAGER BRANCH.—On the right, ½ mile up Pawpaw branch. The Manchester bed has been opened by a pit in this branch, ⅜ mile up it, at altitude 890.

On the right of Pawpaw branch, a mile up it, old entries give the same bed at altitude 920. It probably goes under the branch about 1½ miles up.

On the left, 3⅛ miles up Horse creek, Frank Garrison has a stripping of the Manchester bed with 29 inches of coal (in water) to hard bottom. The bed is said to be about 4 feet thick here, and the bottom, measured too, may have been coal not removed. Its altitude is 895.

HURD BRANCH.

On the right, 3¼ miles up Horse creek: Altitude of mouth, 850.

On the right, ¼ mile up the branch, and on the left of a right hollow, E. G. Hurd has an 80-yard entry into the Manchester bed, with 26 inches of coal 3 yards in, and altitude 900.

On the right, ⅜ mile up the branch, is a long entry, nearly meeting the preceding, at altitude 910. Both are reported to have 29 inches of coal.

On the left of Horse creek, 3⅜ miles up it, James Hensley has a long entry into the same bed with 40 inches of coal 3 yards in, at altitude 880.

In a left branch, 3½ miles up Horse creek, are pits, ⅛ mile up the branch, giving the same bed at altitude 890.

WEBB BRANCH.

On the right, 3¾ miles up Horse creek: Altitude of mouth, 865.

On the right, ⅛ mile up the branch, Bates Shackelford has a 4-yard entry with Manchester coal 30 inches thick at its mouth, and altitude 930.

JOHNSON BRANCH.

On the right, 4¼ miles up Horse creek: Altitude of mouth, 885.

In the branch, ½ mile up it, are pits giving the following, approximately:

Manchester Bed.

Shale.	
Coal	5″
Clay	2″
Coal	24″

Altitude, 955.

The upper seam of coal was not exposed to measurement and the lower seam was in water. Probably the parting would run out under good cover.

HOUSE BRANCH.

On the right, 4¾ miles up Horse creek: Altitude of mouth, 900.

On the right, ⅛ mile up the branch, on the right of a right hollow, Mrs. Alice Brown has a long entry into the Manchester bed with 24 inches of coal at its mouth and altitude 935. Ten feet of shale lie on the coal, the lower foot black. Sandstone shows one foot below the coal.

On the right, ½ mile up the branch, the same bed has been opened at altitude 950.

On the left, ¾ mile up the branch, and again on the left, 100 yards farther up, the same bed has been opened by Washington Owens and James Brown, respectively, with the following sections:

Owens.

	Ft.	In.
Yellow shale	5	0
Black shale	3	0
Coal		12
Shale		6
Coal		26
Fire clay	1½ to 2	

Altitude, 980.

Brown.

	Ft.	In.
Yellow shale	7	0
Brown shale	1	0
Coal		4
Shale		3
Coal		21
Fire Clay	1½ to 2	

Altitude, 1000.

The Owens entry is given above as measured 3 yards in. At the face, 18 yards in, the bottom coal is 4 inches or more thicker. The Brown entry is given as measured at its mouth.

The two entries, seen from across the branch at different heights, appear to be in different seams of coal, but the similarity of sections proves them to be of one seam only.

On the right, 5 miles up Horse creek, in J. C. Brown's springhouse, is 14 inches of coal under 10 feet of shaly and thin-bedded sandstone at altitude 935. This is possibly of the Manchester bed, though it is probably in the place of the usual black shale 70 feet below that coal. In the latter case the Manchester bed lies on the broad bench 70 feet above the coal in the springhouse, and this bench can be traced, apparently, nearly to the coal mentioned next.

The Manchester bed shows as a stain in the road 6¼ miles up the creek, at altitude 985. Fifteen feet of shale, much of it black, lie over the coal and fifteen feet lie under it. Twenty-five feet under is the top of the hard sandstone only one foot below the coal at Mrs. Brown's on House branch.

The same bed shows again on the right of the creek and road, 6½ miles up, at altitude 1000.

PIGEON ROOST BRANCH.

On the right, 6¾ miles up Horse creek: Altitude of mouth, 950.

At the forks, ¾ mile up this branch, altitude 1000, the Manchester coal lies about 20 feet higher, on top of the sandstone cliffs which are conspicuous along the branch.

An eighth-mile up the right fork, on the right, ⅛ mile up a right branch, Mrs. Reed has a long entry into the Manchester bed, with 30 inches of coal at its mouth and 12 yards in, though the entry is in a roll. The 10 feet of cross-bedded sandstone on the coal is furrowed underneath, the furrows 6 inches deep, are filled with sandstone, which give a smooth top to the coal, but, coming down where the coal is removed, give a waving undersurface to the remaining sandstone. A foot or more of fire-clay underlies the coal, and sandstone is below that, as on House branch. The altitude of the entry is 1015.

In the left fork, ¼ mile up it, at altitude 1010, shale is exposed with a southwest dip of possibly 10 per cent, where, normally, it appears that nearly level sandstone should be. Nothing else seen in the vicinity except the roll in the Reed entry is indicative of any irregularity of the measures.

On the left, ½ mile up the left fork, James Bailey has a long entry with the following exhibit, the coal measured 2 yards in:

Manchester Bed.

Shale	3 ft.
Smooth clay sandstone	2 ft.
Black shale	1 ft.
Coal	28″

Altitude, 1035.

From the mouth of Pigeon Roost branch westward to the top of the hill on the London road the following section was obtained:

	Thickness. Feet.	Inches.	Altitude.
Summit			1220
Sandstone	65		1155
Covered	10		
Shaly sandstone	10		1135
Shale	10		1125
Shale or coal	2		
Coal stain		6	1120
Shale	15		1105
Probably sandstone	10		1095
Shale	30		1065
Mostly sandstone	45		1020
Covered	35		
Iron ore		3	985
Dark shale	10		975
Covered (Manchester coal)		5	970
Mostly shale (to creek)	20		950

The 15 feet of shale at altitude 1105, weathering rapidly, leaves a prominent bench which, if correctly traced, is at altitude 1055, 7¾ miles up the creek, giving a dip of strata southwest from Pigeon Roost branch, amounting to something like 2½ per cent. Shales in the creek at the upper point confirm this.

Following are private analyses of coal of the Manchester bed from Horse creek waters, thickness of coal being given, but location not definitely stated:

Inches of coal	30	40	43	27
Moisture	1.95	2.15	1.60	1.55
Volatile combustible matter	35.75	35.52	36.80	36.21
Fixed carbon	57.14	58.33	56.70	58.64
Ash	5.16	4.00	4.90	3.60
	100.00	100.00	100.00	100.00
Sulphur	1.01	0.94	1.18	0.82

On the left of Goose creek, about 2½ miles above Manchester, a Garrard mine gave 31 inches of coal 70 yards in. My sample from this point, analyzed by Dr. Peter, gave:

Manchester Bed—Chem. Report No. 2648.

Moisture	1.20
Volatile combustible matter	38 10
Fixed carbon	54.90
Ash	5.80
	100.00
Sulphur	1.793
Coke (spongy)	60.70
Specific gravity	1.287

"A pure-looking, pitch-black coal with very little fibrous coal and only a few specks of pyrites."

COLLINS FORK.

On the right of Goose creek, 2½ miles above Manchester: Altitude of mouth, 800.

On the right of Collins fork, ¼ mile up it, is the old Garrard mine, with coal hidden by gob to about ¼ mile in, where it is 35 inches thick; by former reports varying from 12 to 44 inches. Its altitude is 819.

Following is a private analysis of coal from this mine, where the coal is given as 36 inches thick:

Manchester Bed.

Moisture	1.60
Volatile combustible matter	37.30
Fixed carbon	58.16
Ash	2.94
	100.00
Sulphur	0.90

On the right, 1 mile up Collins fork, at the mouth of Engine branch and by the road, the Manchester coal was struck in a shaft reported 12 feet deep, making the altitude of the bed about 815. At this point the following section was obtained:

	Altitude.
Springs on shale	965
Bench (not distinct)	950
Bench (on 20 feet S. S.)	905
Black shale (2 to 3 feet)	
Fire-clay (1 foot)	865
Shale (10 feet)	855
Shaly sandstone	835
Road at shaft	815
Goose creek	805

The bench 100 feet over the coal is especially to be noted here, and the replacement by shale and shaly sandstone of hard sandstones below it seen farther down the creek. This is still more noticeable on Goose creek above Collins fork.

On a left branch, 1¾ miles up Collins fork, on the right, ⅜ mile up the branch, an old prospect shows what may possibly be 3 feet of coal or coal and partings, under 8 feet of shaly and thin-bedded sandstone, at altitude 1015. This is of the Howard bed, apparently about 240 feet above the Manchester coal.

A bench opposite the mouth of Buzzard creek, at altitude 880, marks the altitude of the Manchester bed there at about 780, or 35 feet below creek level. An old report gives it as 52 feet (below bottom land level).

BUZZARD CREEK.

On the left, 2¼ miles up Collins fork: Altitude of mouth, 815.

The light pitch of strata up Collins fork increases as the direction becomes more easterly along the lower part of Buzzard creek, the cliff sandstone forming the bench 100 feet above the Manchester coal going below drainage ¾ mile up the creek, at altitude 820.

FURNACE BRANCH (OR LITTLE BUZZARD CREEK).—On the left, 1⅜ miles up Buzzard creek: Altitude of mouth, 830.

On the left, at the head of this stream, Claiborne McCreary has openings into the Whitesburg and Fire-clay coals, the former a prospect and the latter an 8-yard entry, measured half-way in. These openings give:

Whitesburg Bed.
Altitude, 1200.

	Ft.	In.
Dark shale	8	0
Coal		2
Black shale		2
Coal		18

Fire-clay Coal.
Altitude, 1300.

	Ft.	In.
Hard sandstone	12	0
Shale	2	0
Coal		2
Shale		1
Coal		3
Shale		1
Coal		9
Clay		1
Coal		15

These correlations are based on an entry at altitude 890 into the Howard bed on Schoolhouse branch of main Goose creek. Reported coal at altitude 1020 in a well at Mr. McCreary's house is of the thin bed 100 feet above the Howard bed. A rise of strata from the house ⅛ mile southeast to the Whitesburg opening and sharper rise to that of the Fire-clay coal, 100 yards beyond, is indicated.

SAPLING BRANCH.—On the left, 1½ miles up Buzzard creek: Altitude of mouth, 830.

On the right, ¼ mile up this branch, the Howard coal is exposed at altitude 970. In former times the bed was mined to some extent in this vicinity, the coal having been used in evaporating brine from neighboring wells long since abandoned.

SWAFFORD BRANCH.—On the left, 2½ miles up Buzzard creek: Altitude of mouth, 860.

On the left, 2½ miles up this branch, Thomas Swafford has an entry into the Howard bed, with coal 31 inches thick at its mouth and 30 inches 20 yards in. In the point of the hill 100 yards beyond, an abandoned entry of the same bed gave 36 inches of coal under 20 feet of shale with line boulders. Directly under this is 3 feet of shale, coal and shale 9 inches and then 16 inches of coal, showing that the bed is split here as is the case on Otter creek and elsewhere. The altitude of the entry is 975.

On the left, 1¾ miles up the branch, the lower (?) seam, probably thin, has been opened at altitude 990.

On the right, 2 miles up, 15 inches of coal under 4 feet of rough sandstone is opened at altitude 1035. This appears to be the upper seam of the same bed, with sandstone roof instead of its usual shale.

A bench on massive sandstone above this coal, at altitude 1205, is said to carry about 2 feet of coal (the Whitesburg bed?), while a 40-foot cliff cresting the hilltop at altitude 1530 lies between the Haddix and Hazard beds.

On the left, 2¾ miles up Buzzard creek, 10 feet above it, is 6 inches of coal on one foot of fire-clay and between

massive sandstones. This coal at altitude 885 goes under Buzzard creek near the mouth of Sarvis branch, showing a very slight rise up the creek. It is doubtless 100 feet above the Manchester bed.

SARVIS BRANCH.—On the left, 4½ miles up Buzzard creek: Altitude of mouth, 910.

On the left, at Martin Smith's, 1 mile up and 20 feet above the branch, coal and black shale on sandstone indicate the upper seam of the Howard bed at altitude 1060.

On the right, at the same place, a wet entry, under shale, with 2½ feet of coal or coal with partings, is at altitude 1435. Cliffs crest the hills some 80 to 100 feet higher. This coal is probably of the Haddix bed.

On the left by the branch, 1½ miles up it, is 14 inches of coal of the Whitesburg bed in sandstone at altitude 1195.

On the left, 1¾ miles up the branch, 100 yards from the gap to Otter creek, Mrs. Margaret Swafford has a 2-yard entry, under 15 feet of sandstone, the lower half of which is somewhat shaly. The coal is 28 inches thick with a 1-inch parting 8 inches from the bottom. Its altitude is 1420, and the cliff capping the ridge is about 60 feet higher. This bed is evidently the same as that just recited at altitude 1435 as of the Haddix bed. It is (by barometer) 220 feet above the adjacent Fire-clay coal opening on Otter creek.

RUSSELL BRANCH.—On the left, 4¾ miles up Buzzard creek: Altitude of mouth, 930.

Coal at the mouth of this branch, 5 inches thick, may be of the same bed as that noted 10 feet above Buzzard creek, 3 miles up it, although here 30 feet of shale is exposed above it, while down the creek the bed is enclosed in massive sandstone. If the same, there is a rise of strata up the creek amounting to 55 feet in the 1¾ miles, whereas above and below these points the strata dip slightly up-stream.

On the left, ¾ mile up the branch, 20 feet above it, B. T. McCreary has an abandoned timbered prospect with a foot or two of coal at altitude 1040, about the horizon of the Howard coal.

On the right of a left hollow at the head of the branch, a mile up, he has an abandoned entry showing in the dump bituminous, splint and cannel coal. The entry, at altitude 1400, is on top of 30 feet of massive sandstone forming a cliff and 3 feet under shaly sandstone, 5 feet exposed. No cliff sandstone shows in the hill above, which is but about 70 feet higher. This indicates the coal as of the Hazard bed, but, as that bed is not known to have cannel elsewhere and its altitude is indicative of the Haddix, it is referred to that bed.

On the left, 6¾ miles up Buzzard creek, at its head, 150 yards from the gap to Horn branch, John Root has two entries into what is probably the Fire-clay coal. One of the entries is in a roll, but both have 34 inches of bottom coal and a fairly good shale roof. At 8 yards in, one of them has the following bed section:

Shale	15 ft.
Coal	3″
Shale	1″
Coal	1″
Shale	2″
Coal	34″
Fire-clay	2 ft.

Altitude, 1295.

The gap to Horn branch is but 60 feet higher, and the area of coal available is hardly sufficient to overcome the difficulty of transportation to railroad level.

JOE NASH BRANCH.

On the left of Collins fork, 4 miles up it: Altitude of ford near mouth of branch, 824.

James Adams formerly had an opening on the left, ¼ mile up this branch, which gave the following section:

Shale	5 ft.
Coal	9″
Shale	6″
Coal	24″

Altitude, 930.

This appears to be of the bed 100 feet above the Manchester coal.

AERY (OR AYRES) BRANCH.

On the right of Collins fork, 4¼ miles up it: Altitude of mouth, 825.

On the left, a half-mile up this branch, 9 inches of splint coal lies under 21 inches of black slate and 5 feet of shale, at altitude 930.

OLD STABLE BRANCH.

On the left, 4¾ miles up Collins fork: Altitude of mouth 830.

Old openings, ½ mile up this branch, at J. C. White's formerly L. A. Byron's, gave the following:

Altitude, 930.

Shaly sandstone.	
Dark shale	3 ft.
Coal	10″

Altitude, 1040.

Shaly sandstone	15 ft.
Shale	3 ft.
Coal	18″
Shale	17″
Coal and shale	12″
Coal	3″
Shale	3″
Coal	12″

INGRAM (COTTONGILL) BRANCH.

On the left, 5 miles up Collins fork: Altitude of mouth, 830.

A quarter mile up this branch on old opening gave 20 inches of coal, under 5 feet of dark shale, at altitude 925. From 1½ to 2 miles up the branch the following sections were obtained:

Sandstone	15 ft.
Coal	12″
Clay	1 ft.
Sandstone	8 ft.

Altitude, 1265.

Massive sandstone ....20 ft.
Dark shale ..... 5 ft.
Coal .....10″
Clay ..... 6″
Shale ..... 2 ft.
Sandstone .....20 ft.
Altitude, 1120.

Sandstone ..... 4 ft.
Black slate ..... 5″
Shale .....12″
Coal .....22″
Altitude, 1005.

Shale and shaly sandstone .....30 ft.
Black shale..... 1 ft.
Coal .....15″
Shale to the branch, 1½ miles up it..... 3 ft.
Altitude, 915.

The coals at altitudes 930 and 915 on the three preceding branches show that the strata lie almost level there, the bed next above, at altitudes 1040 and 1005, indicating a slight southeasterly dip. The latter are of the Howard bed, and as the Manchester bed is about 250 feet lower, it must be within 50 feet of the bed of Collins fork, and may possibly be found above it in the westerly bend of the fork above Aery branch. Its covering shales show at the ford below.

The 12 inches coal at altitude 1265 seems to represent the rider to the Fire-clay coal.

At John L. Cottongill's, 6 miles up Collins fork, on the right, ⅛ mile up the hollow on the right behind his house, an old opening gives the following:

Haddix Bed.

Shale ..... 3 ft.
Thin bedded sandstone ..... 1 ft.
Coal ..... 9″
Shale ..... 3 ft.
Coal (reported) ..18 to 22″
Altitude, 995.

A thick, hard sandstone lies close below the coal.

WHITE'S CREEK.

On the right, 6⅛ miles up Collins fork: Altitude of mouth, 840.

A half-mile up this creek the cliffs show the change in going westward remarked elsewhere, from sandstones to shales, the cliffs in this case being probably 100 to 200 feet above the Manchester coal.

The only coal reported opened on the creek is at Jack Collins', 2 miles up. Here, on the right, is 10 inches of coal, under shale, at altitude 960, fifteen feet above the creek. On the left a stripping gives the following:

Black slate	3 ft.
Sandstone	2 ft.
Coal	5″
Shale	1″
Coal	1″
Shale	7 ft.

Altitude, 960.

It appears likely that this is of the bed 100 feet above the Manchester bed.

COLD SPRING BRANCH.

On the left, 7½ miles up Collins fork: Altitude of mouth, 849.

A quarter-mile up to the forks of this branch, and on the left, ¼ mile up the left fork, is the following:

Howard Bed.

Massive sandstone	5 ft.
Black slate	2″
Coal	19 to 22″
Massive sandstone	5 ft.

Sandstones occupy most of the 145 feet from the creek to this coal and most of the next 80 feet above it. Strata lie nearly level along the creek, but on the branch they show an east or northeasterly dip.

On a left branch, 9¾ miles up Collins fork, ¼ mile up the branch, on the right, ⅛ mile up a right branch,

the same bed or a lower split from it, has 18 inches of coal, under 3 feet of shaly and massive sandstone, at altitude 980.

DISAPPOINTMENT BRANCH.

On the left, 10 miles up Collins fork: Altitude of mouth, 855.

On the right, ½ mile up the branch, John Riley has, in the point of the hill on the right by his house, a coal stain at altitude 950, and 65 feet higher, ⅛ mile up a right hollow there, the following:

Howard Bed.

Shale.	
Massive sandstone	4 ft.
Coal	24″
Black slate.	
Altitude, 1015.	

The lower coal is probably the lower split of the Howard bed, possibly a part of the interval between them being due to a surface slip.

A half-mile up the left fork from Riley's, and in a left branch, ⅛ mile up it, Charles Knuckles has a pit with coal, in water, probably 24 inches thick, under 2 feet of shaly sandstone, probably the lower split of the Howard bed. Its altitude is 990.

Up the right fork from Riley's the pitch of strata is southwesterly. At Jefferson Frost's, on the right, at the head, 1½ miles up, is the following, the bed section measured 10 yards into a long entry:

Shale	8 ft.
Coal	2″
Shale	7″
Coal	1″
Shale	1″
Coal	25″
Altitude, 1320.	

This opening is so like those of John Root's at the head of Buzzard creek as to admit of no doubt of their correlation, but proof is not complete that they are of the Fire-clay coal bed.

WELLS BRANCH.

On the left, 11¼ miles up Collins fork: Altitude of mouth, 880.

Under a fall in the branch, ¼ mile up it, the Howard bed has 23 inches of coal under 10 feet of sandstone, and with 6 inches of shale between it and the fire-clay floor. Its altitude is 955.

On the right, ½ mile up the branch, an unfinished prospect, shows a considerable amount of squeezed coal under broken shale at altitude 1490. This is probably of the Hazard bed, too high in the hill to be of any value, but indicating a considerable area of the Fire-clay coal below available for delivery to Collins fork.

BULL CREEK.

On the right, 11¾ miles up Collins fork: Altitude of mouth, 860.

Following is a section taken at Mrs. Hopper's, near the mouth of this creek, reproduced from a former report, with altitudes corrected:

Black slate.
Coal ..... 2″
Clay.
Altitude, 1130.

Sandstone .....20 ft.
Black slate ..... 4″
Clay .....15″
Coal .....12″
Clay.
Altitude, 1020.

Sandstone .....45 ft.
Black slate ..... 3 ft.
Cannel coal .....26″
Sandstone .....10 ft.
Altitude, 950.

Sandstone ..... 5 ft.
Coal .....11″
Shale .....10 ft.
Altitude, 895.
Creek, 860.

TURKEY BRANCH.—On the left, 1¼ miles up Bull creek.

On the right, ½ mile up this branch, Wade Swafford has an entry into the Howard coal 24 inches thick, under 7 feet of shale, the lower foot dark, and with black slate floor. Its altitude is 1070. The coal is said to be 36 inches thick in an abandoned entry across the branch.

At about 2 miles up Bull creek, T. Jones has the cannel bed 26 inches thick, under 3 feet of shale, at altitude 990. The splinty cannel is 15 inches thick here, and at the bottom of the bed is block bituminous coal 7 inches thick. The intermediate 4 inches is shale with lime concretions varying up to 3 inches in thickness.

UPPER TURKEY BRANCH.—On the left, 1¾ miles up Bull creek.

On the right, 1¼ miles up the branch, Theophilus Hacker has an abandoned entry into the Howard bed with the following section, as obtained 2 yards in:

Shaly sandstone	3 ft.
Black slate	6″
Coal	12″
Shale	9″
Coal	4″

Altitude, 1150.

The Swafford and Hacker entries mark a change of strata from comparatively hard sandstones below to softer sandstones and shale above them. The pitch of strata as shown by their altitudes probably brings the Howard bed to altitude 1020 at the mouth of Bull creek, and the Manchester should lie about 100 feet below drainage there. The cannel bed appears to be not constant.

At 12⅛ miles up Collins fork the following section shows on the right in the road:

Coal stain.	
Yellow shale	10 ft.
Dark shale	5 ft.
Coal	1 ft.
Shaly sandstone	5 ft.

Altitude, 880.

Above these shales sandstones prevail, but with a much larger proportion of shales than on Bull creek. The slight up-stream dip of strata in evidence throughout most of Collins fork continues nearly to its head, the top of the sandstone under the Howard coal at 14 miles up the fork being at altitude about 950. Thence to the head the rise appears to be somewhat rapid.

No coal openings were found above Hammond fork, on Collins, but, across the divide, on the head of Little Richland creek, Eli Mills has the following, at the face of a 5-yard entry:

Howard Bed (?)

Shale	2 ft.
Coal	6″
Shale	4″
Coal	6″
Shale	3″
Coal	4″

Altitude, 1100.

HAMMOND FORK.

On the left, 12 miles up Collins fork: Altitude of mouth, 860.

This creek lies for most of its length in a syncline with rather rapid rise of strata on the north. No coal is opened on it below Horn branch.

While correlations of coal on this fork and its branches are given with a considerable degree of confidence, they are still left open to correction. The main evidence for the correlations adopted lies in the split bed, believed to be the Howard, found near the base of the hills at several points.

HORN BRANCH.—On the left, 2 miles up Hammond fork: Altitude of mouth, 880.

Opposite the mouth of a left branch, at John A. Riley's house, 1 mile up Horn branch, is a cliff 20 feet high, with top at altitude 930. An eighth mile up this left branch, and ⅛ mile up its left fork, the top of the sandstone, with 6 inches of coal upon it, is at altitude 960, giving a northwest rise of about 2½%.

Continuing up this left fork to ¼ mile up it, and thence ⅛ mile up a left branch to two entries at its head, where the following section was obtained, the coal measured in each 5 yards in:

Fire-clay Coal.

Shale	2 ft.
Shaly sandstone	2 ft.
Coal	3″
Shale	3″
Coal	1″
Shale	1″
Coal	34″

Altitude, 1260.

The same thin coal, 5 inches, between shaly sandstones, shows ⅛ mile up the right fork, at altitude 980.

At ¼ mile up the right fork, on the right, ¼ mile up a left hollow, John A. Riley has a long entry measured 33 yards in with the following results:

Fire-clay Coal.

Black shale	1½ ft.
Coal	3″
Shale with coal	3″
Coal	35″

Altitude, 1275.

As with the coal of the same bed on the head of Buzzard creek, the area here is small. The graded road up to the entry shows almost continuously thin-bedded and shaly sandstones.

At Fielding Hammond's, on the left, 2 miles up Horn branch, 15 feet above it, an old opening is said to have given 18 inches of coal. This appears to be the upper seam of the Howard coal, risen from the branch ¼ mile below. At 2¼ miles up the branch the lower seam shows, on 10 feet of massive sandstone, at altitude 985. This rapid rise of strata continues beyond probably only so far as to carry these seams over an anticline and to about 300 feet below the Root coal on the head of Buzzard creek.

SHOP BRANCH.—On the right, 4½ miles up Hammond fork: Altitude of mouth, 910.

On the left, ¼ mile up the branch, the two thin coals of the Howard bed appear as follows:

Coal	15″
Covered	10 ft.
Shale	10 ft.
Coal	19″

Altitude, 960.

Passing a thin stain in sandstone in the road, ¾ mile up the branch, at altitude 1035, and the gap to Mill (or Cole) creek at altitude 1130, southwest from the latter ⅛ mile is the following:

Fire-clay Coal.

Shaly sandstone	5 ft.
Coal	1″
Shale	6″
Coal	15″
Shale	1 ft.
Coal	6″

Altitude, 1200.

A 3-yard entry is driven into the 15 inches of coal, the 6 inches at the bottom apparently unknown until found by the writer.

An old entry on the right, 4¾ miles up Hammon fork, gives the lower of the Howard seams with 17 inches of coal, under 10 feet of shaly sandstone, at altitude 945, 30 feet above the creek.

On the left, 5 miles up the fork, the two seams of the same bed show as in the following section:

Howard Bed.

Massive and shaly sandstone	10 ft.
Coal	10″
Fire clay.	
Shaly sandstone	15 ft.
Coal.	
Shaly sandstone	10 ft.

Altitude, 945.

Fern impressions are abundant in the roof of one of these seams.

GARLAND BRANCH.—On the left, 5½ miles up Hammond fork: Altitude of mouth, 930.

The upper seam of the Howard bed has been opened on both sides of this branch, beside the road up Hammond fork. On the right, under shelly sandstone, are 20 inches of coal, with a shale parting 2 inches thick 5 inches from the bottom. Its altitude is 950.

On the left, at David Smith's, 1½ miles up the branch, and on the right, ¼ mile up the right branch there, the following coals were found:

Altitude, 1005.		Altitude, 1175.	
Shaly sandstone	7 ft.	Sandstone	2 ft.
Coal	4″	Shale	6 ft.
Shale	18″	Coal	1″
Coal	4″	Shale	5″
Shaly sandstone.		Coal	14″

The lower bed, 5 feet above the creek, is probably the same as the 6 inches coal found under the Riley coal on Horn branch. The upper is probably of the Whitesburg bed.

At the forks of Hammond fork, 6 miles up it, the altitude is 940.

LEFT FORK.—On the right, ¼ mile up this fork, is 5 inches of coal, under 30 feet of dark shale, at altitude 965. It lies on massive sandstone in the stream, under which is the Howard bed, at altitudes probably about 945 and 930.

An eighth-mile to the left from the above, Nelson Smith has a 25-yard entry with a rather strong southeasterly dip. Its bed section, 5 yards in, follows:

Fire-clay Coal.	
Sandy shale	10 ft.
Coal	1″
Shale	9″
Coal	30″
Altitude, 1250.	

The main seam is somewhat slaty in the middle. It is about 30 feet above a bench and 70 feet below a small cliff.

On the left, ½ mile up the left fork, James Smith has an entry into the same bed, under shale, with 29 inches of coal, all good, at altitude 1255.

On the left, at the head of the left fork, 1½ miles up it, Jabez Smith has entries into two beds, the lower measured at its mouth as given below, and the upper, closed, is given as reported:

Shaly sandstone	15 ft.
Coal	7″
Shale	11″
Coal	35″

Altitude, 1355.

Shale	6 ft.
Coal	1″
Shale	14″
Coal	21″

Altitude, 1270.

The lower bed seems to be at the right level for the Fire-clay coal, but in that case the Haddix bed is nearer to it than has been found elsewhere. The upper opening may be of the Fire-clay coal and the lower of the Whitesburg.

RIGHT FORK—HI SMITH BRANCH.—On the right, ⅛ mile up the right fork: Altitude of mouth, 945.

On the right, ¾ mile up this branch, is an entry with the following section, as measured at the face, 12 yards in:

Haddix Bed.

Sandstone	5 ft.
Shale	5 ft.
Coal	1″
Shale	3″
Coal	1″
Shale	2″
Coal	36″

Altitude, 1340.

UPPER GOOSE CREEK.

On the right at the ford, ⅛ mile above Collins fork, 2⅝ miles above Manchester, the Manchester coal, 29 inches thick, under 8 feet of black shale, and on 3 feet of brown shale, lies at altitude 805, 3 feet above low water level.

On the left, 3⅛ miles above Manchester, behind the Joseph Jones house, a thin coal, said to be about 18 inches, between thick shales, lies at altitude 915. This is of the bed about 100 feet above the Manchester coal.

On the left, 3¼ miles above Manchester, Jeremiah Smith struck the stain of the Howard bed in digging a posthole, at altitude 1055. This gives the best opportunity found for determining the interval from it to the Manchester bed, which has just been noted at a point ¾ miles west at altitude 805. There is a slight up-stream dip here, but apparently none on an east-west line, and the Jones coal opening, about 100 feet above the Manchester bed, serves as additional evidence of nearly level strata on that line. The interval is, therefore, very near to 250 feet.

A quarter-mile to the left of Goose creek, 3½ miles above Manchester, Mr. Smith has an opening into 25 inches of coal under 3 feet of shale, at altitude 1130. The bench of the Howard coal below it is at altitude 1030, the coal itself probably a little higher.

SHOP-BOTTOM BRANCH.

On the right, 4 miles above Manchester: Altitude of mouth, 810.

On the left, ¾ mile up the branch, Henry Clay has an abandoned entry into the Howard bed, giving at its mouth 22 inches of coal, with 3 inches shale parting 4 inches from the bottom, and 8 feet of shale covering. Its altitude is 1030.

LOCKHART CREEK.

On the left, 4½ miles above Manchester: Altitude of mouth, 815.

On a left branch, 2 miles up the creek at Beverley White's, on the left of the branch, ¼ mile up it, a pit shows 18 inches of coal under 2 feet of black slate and of shale on that, at altitude 1035. This is of the Howard bed, but black slate is an unusual roof for it.

On the right, 2½ miles up, is 18 inches of coal in thick shales, at altitude 935, fifteen feet above the creek. The Manchester bed is 100 feet below this coal.

On the left of the road gap, ¼ mile above Lockhart creek, an old Howard bed opening lies at altitude 1015, and ¼ mile farther up, at altitude 980.

An eighth-mile farther, 5½ miles from Manchester, the following section was obtained:

	Feet	Altitude
Bench		995
Sandstone cliff	15	980
Shales	30	835
Thin slipped coal		835
Creek		825

At 5¾ miles up (50 yards above Free Hollow) the slipped coal from 100 feet above the Manchester bed appears again in the road at altitude 845, and 175 feet below the Howard bed bench.

From this point the dip is rapid to the house of the White heirs (formerly Mrs. S. R. White), 6 miles from Manchester, whence a line of openings and strippings fall, in less than a quarter mile, from altitude 980 to 925. Following is the bed-section at one of the entries and an analysis by Dr. Peter of my sample, omitting the bottom 4 inches, from 7 yards underground:

Howard Bed.

Shale.	
Coal	2″
Shale	1″
Coal	22″
Shale	5″
Coal	16″

Analysis.

Chemical Report No. 2649.

Moisture	1.48
Volatile combustible matter	35.92
Fixed carbon	54.70
Ash	7.90
	100.00
Sulphur	0.885
Coke (spongy)	62.60
Specific gravity	1.278

From these openings to Rocky branch the bed is conspicuous in and along the road at numerous points, its covering where noted being 5 feet of shale under 3 feet of thin-bedded sandstone, and beneath the coal 10 feet of hard sandstone on 30 feet of softer sandstone or shale.

ROCKY BRANCH.

On the left, 7½ miles from Manchester: Altitude of mouth, 825.

On the left, ½ mile up the branch, E. C. Howard has an 8-yard entry from which the Howard bed derives the name here given it. Half way in the entry it has the following bed-section:

Howard Bed.

Shale	2 ft.
Coal	2″
Shale	1″
Coal	3″
Shale	1″
Coal	16″
Shale	5″
Coal	16″

Altitude, 895.

GRANNY BRANCH.

On the left, 7¾ miles from Manchester: Altitude of mouth, 825.

A quarter-mile up this branch, on the left, ⅛ mile up a left hollow, J. B. Walker has a long entry into the

Howard bed at altitude 890, with the following bed-section and analysis of the coal, the latter from my sample excluding the upper 2 inches:

Howard Bed.

Sandy shale	8 ft.
Coal	2″
Shale	2″
Coal	3″
Knife-edge parting.	
Coal	18″
Shale	8″
Coal	16″
Black slate.	

Analysis.

Lab. No. 3583.	
Moisture	1.60
Volatile combustible matter	39.25
Fixed carbon	55.25
Ash	3.90
	100.00
Sulphur	1.33
Coke, cellular, brittle	59.15

The lower parting varies from 5 to 10 inches in thickness.

BILLY BRANCH.

On the left, 8 miles from Manchester: Altitude of mouth, 825.

A stain of the Howard bed is exposed in the road on the projecting spur at the mouth of this branch, at altitude 890. Two feet below the stain is 4 inches of iron ore on a hard sandstone forming a cliff quite down to Goose creek.

From the branch, 1¼ miles up it, coal from this bed has been taken at altitude 900, and, possibly, a higher seam of the same shows in the bank on the left just above.

At 1½ miles up, a pit in the branch is reported to have 18 inches of coal. Its altitude is 920. At the forks, 1¾ miles up, the bed is below drainage.

On the left, ½ mile up the right fork, a considerable stripping, abandoned, indicates moderate thickness only of coal, all covered except its top. Ten feet of clay shale overlie it and a hard sandstone cliff shows about 50 feet above it. It is of the Whitesburg bed at altitude 1080.

On the right of a left hollow, ¾ mile up the right fork, ¼ mile up the hollow, James Wages has two entries, 50 yards apart, the lower giving the following at its mouth:

Fire-clay Coal.

Sandstone	5 ft.
Shale	12 ft.
Lime rock	6 to 8″
Black shale	2″
Coal and 5 partings	34″

Altitude, 1145.

At 2 yards into the upper entry the coal and partings, of which there are but three, are reduced to 31 inches. Under this is 2 inches of bituminous shale and then fire-clay to standstone beneath. Though apparently at about the right height for the Whitesburg bed, that bed having been found, as just mentioned, at a lower level, these openings resemble in their bed-sections and coverings the Fire-clay coal opening on Martin creek and they are confidently referred to the latter bed.

SCHOOLHOUSE BRANCH.

On the right, 8¾ miles from Manchester: Altitude of mouth, 830.

On the left, ½ mile up the branch, Joseph Keene has a long entry with section as given following, taken 3 yards in:

Howard Bed.

Sandstone	10 ft.
Shale	1 ft.
Coal	3″
Knife-edge parting.	
Coal	20″
Black shale	20″
Coal	9″

Altitude, 890.

On the left, 9¼ miles up Goose creek, Elhannon Wilson had an entry which gave the following bed-section:

Howard Bed.

Shale	8 ft.
Coal	2″
Shale	1″
Coal	2″
Shale	1″
Coal	16″
Shale	10″
Coal	15″

Altitude, 900.

MARTIN CREEK.

On the left, 9½ miles from Manchester: Altitude of mouth, 830.

Outcrops of the Howard bed, split into two seams, show in and by the road, on the left, ⅛ to ¼ mile up this creek at altitudes 915 and 920; and again by the road, 1¼ miles up, where they are 15 feet apart, at altitude 905, and 920.

In a pit, ⅛ mile up a right branch and in it, 1¼ miles up Martin creek, the coal is reported 20 inches thick. At altitude 895, it is probably of the lower seam.

MOSES BRANCH.—On the right, 1¾ miles up Martin creek: Altitude of mouth, 905.

On the right, ¼ mile up this branch, Silas Wages has opened the Fire-clay coal with the following section:

Fire-clay Coal.

Sandstone	4 ft.
Shale	6 ft.
Coal	4″
Shale	1″
Coal	12″
Shale	1″
Coal	6″
Flint fire-clay	4″
Black-jack	4″

Altitude, 1225.

Next below the black-jack is said to be 30 inches of shale and then a foot more of coal.

The upper split of the Howard coal is probably about at altitude 925, giving the interval between the Howard and Fire-clay beds as 300 feet. Adding to this the 250 feet interval from the Howard bed to the Manchester, as found on Goose creek just above Collins fork, gives 550 feet interval between the Fire-clay coal and the Manchester bed; a close agreement with the 535 feet found between them near the mouth of Goose creek.

On the left, ½ mile up the branch, J. B. Walker has an entry with the following section, as measured at its mouth:

Haddix Bed.

Shale	5 ft.
Shale with coal	10″
Coal	9″
Shale	2″
Coal	22″
Shale	20″
Coal	8″
Cannel coal	10″

Altitude, 1405.

At the faces, 60 yards in, the bottom coals are reduced from 18 inches to 15 and 17 inches, the parting next above them is increased to 22 and 24 inches, and at one face the upper part is 37 inches thick, including a parting of 1 inch, 2 inches from the top.

Some 30 to 40 feet above the coal is a 15-foot cliff, a common attendant to the Haddix bed.

Assuming that strata lie level between this and the Fire-clay coal opening, as they probably nearly do, the interval between these two beds is 180 feet.

At Mr. Walker's house, on the left, 2 miles up Martin creek, the stain of the upper split of the Howard coal shows at altitude 940.

STEWART BRANCH.

On the left of Goose creek, 10¼ miles from Manchester.

On the left, ¼ mile up this branch, Laura R. White has a wet entry, under 5 feet of shale, into the upper split of the Howard bed, giving 24 inches of coal at altitude 905.

The same coal has been partly opened by the road up Goose creek, 10⅜ miles from Manchester, at altitude 892.

BROWN BRANCH (OR BLYTHE).

On the right, 11 miles from Manchester.

A prospect of Laura R. White's on the right, ¼ mile up this branch, gives 22 inches of coal, under 5 feet of shale and on a black slate and coal floor; again the upper split of the Howard bed with altitude of 885. The lower split is reported in the branch, 10 feet lower, with coal 24 inches thick.

OTTER CREEK.

On the right, 11¼ miles from Manchester: Altitude of mouth, 847.

On the right, ⅛ mile up this creek, Robert Wood has a long entry into the Howard bed, with 23 inches of coal measured 4 yards in, at altitude 875. Sandstone from its floor to the creek, 25 feet below, prove it of the lower seam of the bed. Over the coal are 2½ feet of shale and then 12 feet of sandstone and shale.

Of old entries on the right, 1¼ miles up the creek, in the lower split of the same bed, one gives 22 inches of coal under 7 inches of coal and shale, upon which is a laminated sandstone showing a tendency to honeycomb. This entry is at altitude 890.

At the forks, 1¾ miles up Otter creek, altitude 895, is a cliff on the left over the Howard bed, composed of shaly sandstone and shale, which can be recognized at frequent intervals, farther up the creek until it goes below drainage, and also on Goose creek for two miles above Otter creek.

On the right, at the Otter forks, 18 inches of coal, the upper seam of the Howard bed, is exposed at altitude 900.

RIGHT FORK.—At Vogel postoffice on the right, 1½ miles up this fork, is 10 inches of coal, under 8 feet of dark shale, and then a thick massive sandstone. Its altitude is 1005, 20 feet above the creek.

On the right, ⅛ mile up a right hollow at Vogel, is a long entry having 15 inches of coal at its mouth, 10 feet of hard sandstone under its 1½ feet of fire-clay floor, and above it 5 feet of shale under sandstone. Its altitude, 1200, makes it 300 feet above the Howard coal at the forks of Otter creek, and therefore the Fire-clay coal, as the strata lie nearly level along the creek to this point.

At the mouth of Swafford branch, 2½ miles up the fork, the lower coal at Vogel goes below drainage at altitude 995.

On the right, 3¼ miles up the fork, 20 feet above it, is 16 inches of coal under 3 feet of shale and 4 feet of sandstone, at altitude 1215. Probably again the Fire-clay coal.

On the right, ¼ mile up a right branch at this place, J. G. Matthews has a 10-yard closed entry at altitude 1515. Apparently the bed is about 3 feet thick, under 5 feet of shale and then sandstone. Black slate, bituminous and cannel coal were found in the dump, the latter in blocks 8 to 10 inches thick. Sandstone cliffs 15 feet high cap the hills 50 feet above the coal. The bed has the characteristics of the Flag bed, and, 300 feet above the supposed Fire-clay coal, is, with little doubt, so correlated.

LEFT FORK—KNOB LICK BRANCH.—On the left, ¼ mile up the left fork: Altitude of mouth, 910.

On the right, ¼ mile up the branch, John Duff has a long entry, measured 15 yards in, giving 42 inches of coal at altitude 1460. The bottom coal is an especially fine bright block without cleavage planes, and the whole looks good. Six inches of shale under 10 feet of sandstone overlie the coal, and a 15-foot sandstone caps the hill 50 feet higher, as on the head of the right fork. This, also, is about 600 feet above the Howard bed and is referred to the Flag bed.

On the left, ¾ mile up the branch, 10 feet above it, an entry 2 yards in gives 16 inches of coal, under 4 feet of shale, the upper 3 feet sandy, at altitude 1125. This is probably of the Fire-clay coal.

At a spring on the right, ½ mile up the left fork, is 3 inches of coal, probably of the Fire-clay coal bed, at

altitude 1120. An opening at the place would very likely uncover more coal below.

DRUM BRANCH.—On the left at Albert May's, ¾ mile up the left fork.

On the left, ¼ mile up the branch, is a stripping, 40 yards long, disclosing the following:

Fire-clay Coal (?)	
Shaly sandstone	12 ft.
Shale with calcareous concretions	3 ft.
Coal	7″
Shale	3½ ft.
Coal	16″
Fire-clay.	
Altitude, 1140.	

The left fork has forks 1¾ miles up it. Thence, on the left of the right fork, ¼ mile up it, John G. Matthews has a 5-yard entry, on shale and under sandstone, with 25 inches of coal at its mouth, and at altitude 1190. This is probably of the Haddix bed.

From the forks, 1¾ miles up, to a right branch ½ mile up the left fork, the sandstone over the coal last mentioned is passed over and a change met from a narrow valley to a comparatively open country with lighter slope to its hills. This is ascribed to the resistance to disintegration of the hard sandstone over the Haddix coal.

The mouth of the branch just referred to is at altitude, 1250. On the right ¼ mile up it is a covered opening into what is presumably the Hazard coal at altitude 1295, a rise of strata from the opening on the right fork of possibly 50 feet being assumed, though against the direction of the prevailing dip. The topography indicates a continued southwest rise to the Mill creek divide.

Both on the right and left of Goose creek, 11½ miles from Manchester, ¼ mile above Otter creek, Robert Wood has openings into the Howard bed; at altitude 870. On the right into the lower split with 22 inches or more of coal; and on the left into the upper split with the following section:

Howard Bed. Upper Split.

Shale	15 ft.
Coal	4″
Shale	3″
Coal	18″ or more.

Altitude, 870.

Both of these openings were in water and only the top of the coal seen.

The 50 feet of shale exposed at the mouth of Mud Lick shows that both parts of the Howard bed are at or below creek level there, which is at altitude 864.

TIMBERTREE BRANCH.

On the left, 12¾ miles above Manchester: Altitude of mouth, 865.

Following are the three coals found on this branch; none carried under roof: On left, ⅞ mile up:

Fire-clay Coal Rider.

Rough sandstone	5 ft.
Coal	7″
Clay	1″
Coal	5″

Altitude, 1245.

On the right, ⅝ mile up:

Whitesburg Bed.

	Feet
Laminated sandstone	5
Black shale with sandstone parting	1½
Shale and coal	5

Altitude, 1160.

On right, ¾ mile up:

Fire-clay Coal.

Shaly sandstone	12 ft.
Coal	6″
Flint fire-clay	6″
Coal	6″

Altitude, 1215.

All are on steep hillside within 30 feet of the branch. In the Whitesburg bed there are 3 seams of coal, the thickest not more than 12 inches.

The Howard bed being at altitude about 865 at the mouth of the branch, a rise of strata up the branch of some 50 feet is indicated, in order to bring that bed to 300 feet below the Fire-clay coal.

A bench on the right of the openings at altitude 1380 gives the approximate position of the Haddix bed, its attendant 20-feet cliff above it with top at altitude 1405. A bench at 1445 marks the place of the Hazard coal. With the hill rising 140 feet higher these coals have area for working here if found of sufficient thickness.

TOM'S BRANCH.

On the right, 13½ miles from Manchester: Altitude of mouth, 870.

In a former search for coal on this branch there was found the following at J. T. Smith's, near the mouth of the branch:

Sandstone cliff	50	ft.	Altitude, 1370.
Covered	15	ft.	
Shale	1	ft.	
Clay with lime concretions	1	ft.	
Shale	2	ft.	
Black slate	15″		
Shale	10″		
Coal	11″		Altitude, 1350.
Clay.			
Covered	20	ft.	
Massive sandstone	10	ft.	
Earth and thin iron ore	1½	ft.	
Massive sandstone	1½	ft.	
Coal	9″		Altitude, 1315.
Covered.			
Dark impure limestone	2	ft.	Altitude, 1275.
Covered.			
Shaly sandstone	10	ft.	
Coal	12″		Altitude, 1240.
Clay.			
Covered.			
Shale	5	ft.	
Iron ore	3″		
Shale	2	ft.	
Thin coal			Altitude, 1200.
Covered.			
Sandstone	20	ft.	
Coal	18″		Altitude, 1145.
Covered.			
Shaly sandstone	10	ft.	
Clay	6″		
Coal	21″		
Shale	1″		
Coal	1″		Altitude, 1075.
Clay	5″		
Shale and sandstone	20	ft.	
Covered.			
Shale	5	ft.	
Shaly sandstone	4	ft.	
Coal	30″		
Cannel coal	5″		Altitude, 915.

My sample of the 30 inches bituminous coal and a specimen of the cannel from a now abandoned entry into the lowest bed just noted, taken from 5 yards underground, yielded, on analysis by Dr. Peter:

J. T. Smith Entry.	No. 2653. Bituminous.	No. 2655. Cannel.
Moisture	2.80	0.30
Volatile combustible matter	29.40	44.16
Fixed carbon	57.00	43.74
Ash	10.80	11.80
	100.00	100.00
Sulphur	1.178	1.244
Coke	dense friable.	dense.
Color of ash	light brown.	dark gray.
Specific gravity		1.60

This bed is probably the same as that at Vogel, on Otter creek, altitude 1005, about 100 feet above the Howard bed. The Fire-clay coal may be between those of the preceding section at altitudes 1075 and 1145, the Haddix at 1240 and the two higher coals of the Hazard and Flag beds. The absence of any thick coal in this vicinity is almost conclusively proved by these seven coal beds found.

MILL BRANCH.

On the left, 13¾ miles from Manchester: Altitude of mouth, 875.

On the left, ¾ mile up this branch, and 15 feet above it, Anderson Smallwood has an entry in which the following bed-section was taken, necessarily at several points underground:

Rough cliff sandstone	20 ft.
Covered	20 ft.
Sandstone	10 ft.
Shale	1 ft.
Shale and coal	3″
Coal	4″
Shale	1″
Coal	20″
Sandstone	11″
Shale	6″
Coal	4″
Jack-rock	7″
Coal	23″

Altitude, 1060.

This brown jack-rock near the bottom of this bed, similar to that found on Timbertree branch beneath the flint fire-clay of the Fire-clay coal bed serves to correlate this as of the Fire-clay coal bed, the next parting above, of uniform thickness in the entry, but variable proportion of sandstone to shale, possibly being the only separation of the bed from its rider.

The Haddix bed is exposed in a rock house on the left, one mile up the branch, with the following section:

Sandstone	4 ft.
Coal	9″
Shale	4″
Coal	12″
Covered	5 ft.
Shale	10 ft.

Altitude, 1230.

A quarter-mile farther up the branch the flatter topography, due to the hard sandstone under the Hazard bed and soft shales above it, as on the left fork of Otter creek, is plainly evident.

In the left bank of Goose creek, 14½ miles from Manchester, a stripping has been made with 16 inches of coal under 3 feet of shale and 50 to 60 feet of sandstone. This, at altitude 886, is probably of the Whitesburg bed, involving a dip from Tom's creek of nearly 200 feet in about a mile, the maximum along the stream from Manchester where the southeasterly dip begins, and to Mill creek, near which it ends.

On the right branch, 14¾ miles from Manchester, on the right, ¾ mile up the branch, and 25 feet above it, Frank Wages has an opening into the Haddix bed with 19 inches of coal, at altitude 1110. The coal is in part "bird-eye" (showing smooth shiny black spots up to ½ inch diameter however any lump may be broken) with fine apparent granulation, like the Jellico coal, but impossible to be of that bed. Above and below the coal is an inch or two of black slate, and on the slate 10 feet of shale.

MILL CREEK.

On the right, 15 miles from Manchester: Altitude of mouth, 892.

With the Whitesburg bed supposedly 10 to 20 feet under the mouth of Mill creek, the Fire-clay coal should be found on one of the low cliffs opposite and not over 50 feet above it.

On the left, ½ mile up the creek, Thomas Smith has a 3-yard entry, under 10 feet of sandstone, with 18 inches of coal at altitude 1005; probably the Fire-clay coal rider.

A mile up Mill creek, on the right, ½ mile up a right branch there, the Bowen heirs have an opening, not driven to roof, in which the following appears:

Earth.	
Coal	18″
Knife-edge parting.	
Coal	3″
Shale	1″
Splint coal	9″
Altitude, 1400.	

If, as appears to be the case, the Haddix bed is here at about altitude 1140, this must be of the Hindman or a still higher bed. It does not appear to have the soft shale covering which is almost, if not quite invariably, a marked feature of the Hindman bed.

Mill creek has forks 1¾ miles from its mouth.

RIGHT FORK.—On the right, ¼ mile up the fork, 10 feet above it, an entry shows about 2 feet of coal with 2 feet of shale and then 5 feet of laminated sandstone above it, of the Haddix bed, at altitude 1150.

A rapid rise of strata up the right fork is evident, and at 1 mile up the fork in the road on the right, the stain of the Hazard coal is exposed, at the base of yellow shales, at altitude 1300. The cliff-rock under the coal is conspicuous in the road a half-mile below and the country is more open after ascending it, as noted across the divide to Otter creek.

LEFT FORK.—On the right, ⅛ mile up this fork, the Bowen heirs have an entry into the Haddix bed with 22

inches of coal at the face, 10 yards in, under 15 feet of sandstone, the lower two feet of which is shaly. Its altitude is 1130.

On the right, ¼ mile up and at stream level, the same bed is opened with 24 inches of coal, under 2 feet of shale and then 10 feet of shaly sandstone, at altitude 1140.

From this opening the valley rises quickly over the sandstone to the Hazard bed level, where it is comparatively flat again.

ASHER FORK.

On the left, 16½ miles above Manchester: Altitude of mouth, 941.

On the left, ½ mile up the fork, at John Roark's, is 6 inches of coal (the Whitesburg bed?) at altitude 995, and an opening into about 3 feet of coal, with one inch shale parting in the middle and 3 feet of shale upon it, at altitude 1240. The same bed, probably the Haddix, shows on the right of the fork at the same height.

Coal has been taken from the fork, 1½ miles up it, at altitude 1295, probably from the Fire-clay coal rider as the strata rise rather rapidly after the first mile up the fork to this point.

At Charles Roark's, 2 miles up, 100 yards north of the road where it crosses the Red Bird divide, is a 10-yard entry with 25 inches of coal, under 5 feet of shale, possibly of the Hazard bed, at altitude 1485. Though level with the gap, a large area of this bed is present here, the hills rising 300 to 400 feet above it.

Opposite the mouth of Asher fork, on the right of Goose creek, an old opening of the late Woodson Mills gave the following section:

Fire-clay Coal (?).

Shale	5 ft.
Coal	1″
Shale	5″
Coal	1″
Coal	4″
Shale	2″
Coal	18″
Black slate	3″
Coal	4″

Altitude, 1060.

The bottom coal, in water, was not fully seen.

This appears likely to be of the Fire-clay coal bed, but, as with other openings above Mill creek, there was found little more definite guide to correlation than their altitudes combined with the apparent rise or fall of strata.

STEWART BRANCH.

On the left, 17½ miles from Manchester: Altitude of mouth, 983.

On the right, ¼ mile up the branch, 10 feet above it, is 7 inches of coal, with a foot of shale and coal under it, and 10 feet of laminated sandstone upon it, which, at altitude 1025, may represent the Whitesburg bed.

On the left, ¾ mile up the branch, Bailey Stewart has an opening into the same bed as that of the Mills opening opposite the mouth of Asher fork, from which the following was obtained:

Fire-clay Coal (?).

Laminated sandstone	10 ft.
Clay sandstone	20 ft.
Shale	1 ft.
Coal	21 to 24″
Shale	2″
Coal	4″

Altitude, 1125.

Rise of strata up the branch is probably rapid. The shale roof has abundant fine bark impressions, said also to be frequent in the roof of the Mills opening.

Cliffs on the right of Goose creek, 17¾ miles from Manchester, seemed to offer a help to correlation and their altitudes were obtained. With the creek at this point at altitude 1000, slight benches were found at approximate altitudes of 1060, 1140 and 1165, indicating the locations of the Whitesburg and Fire-clay coals and the rider; a 10-foot cliff at 1455 near the top of the hill. Under these cliffs are probably the Haddix and Flag coals.

On the left of Goose creek at the Jackson mill site, 18½ miles from Manchester, the following section was formerly obtained from a now abandoned opening of the Smith heirs:

Fire-clay Coal (?).

Shale and shaly sandstone	5 ft.
Coal	4″
Shale	3″
Coal	27″
Shale	2″
Coal	15″

Altitude, 1120.

HUN JACKSON BRANCH.

On the right, 18¾ miles from Manchester: Altitude of mouth, 1050.

On the right, ¼ mile up the branch, Isaac Jackson has a long entry into the Fire-clay coal with a rider six feet above it as in the following section:

Fire-clay Coal (?).

Black slate	3 ft.
Cannel coal	10″
Shaly sandstone	6 ft.
Coal	51″

Black slate.

Altitude, 1145.

Analysis of my sample of the 51 inches of bituminous coal by Dr. Peter yielded:

Fire-clay Coal.

	No. 2647.
Moisture	1.10
Volatile combustible matter	35.60
Fixed carbon	56.90
Ash	6.40
	100.00
Sulphur	0.885
Coke (light spongy)	63.30
Specific gravity	1.288

"A pure-looking coal. No apparent pyrites and but little fibrous coal. Ferruginous stains on some of the pieces."

INDIAN GRAVE BRANCH.

On the left, 19¼ miles from Manchester: Altitude of mouth, 1073.

On the right, ⅛ mile up the branch, a 3-yard entry into what appears to be the Fire-clay coal gives 34 inches of coal, under sandstone, at altitude 1120. This bed goes below drainage ½ mile up the branch with 19 inches of coal, under 25 feet of sandstone, at altitude 1120.

Thirty feet above this last coal is 13 inches more coal under 7 feet of shale in which is about 6 inches of black slate. The coal is probably the rider showing as cannel coal on Hun Jackson branch.

On the left at the branch, 1¼ miles up, opposite Isaac Jackson's house, is an 8-yard entry into the Haddix(?) bed, which gave great improvement as it was advanced underground, as shown by early and recent measurements:

At Mouth.		At Face.	
Sandstone.		Sandstone.	
Coal	3″	Coal	8″
Shale	3″	Parting	1″
Coal	7″	Coal	7″
Clay	5″	Bone coal	1″
Coal	14″	Coal	20″

Altitude, 1370.

The coal is bituminous with a little splint, all apparently good, the former bright and rich-looking, with some in which the lamination is hardly perceptible. The upper parting at the face is a mixture of shale or clay and pyrites, which may be expected to disappear on farther entrance into the hill.

A half-mile up the right fork from Jackson's house the following was obtained which, in its abundance of shale and clay and height relative to the preceding coal, seems to identify the coal as of the Hazard bed:

Hazard Bed.

Shale	5 ft.
Coal	11″
Clay	1 ft.
Sandstone	5 ft.
Coal and shale	17″
Shale	5 ft.

Altitude, 1410.

On the right, 19¾ miles above Manchester, 100 yards below a schoolhouse, is 16 inches of coal in sandstone, at altitude 1150. This bed shows again, on the left, 20 miles above Manchester, 18 inches of coal, on 4 inches of black slate and under 15 feet of sandstone, at altitude 1185, and 35 feet above the creek. These two are probably of the Fire-clay coal bed.

BUCK SMITH BRANCH.

On the left, 20¾ miles from Manchester: Altitude of mouth, 1201.

On the right, ⅛ mile up the branch, is 11 inches of coal, under 5 feet of shaly sandstone, at altitude 1235. Strata appear to rise up the creek here faster than its bed, and this, therefore, is probably of the Whitesburg bed.

A mile up the branch to its forks at altitude 1360, on the right, ¼ mile up the right fork, is Darby Smith's entry with the following section:

Shale	2 ft.
Black slate with coal	2 ft.
Shale	1 ft.
Coal	16″
Shale	14″
Coal	29″

Altitude, 1715.

Strata doubtless rise rapidly from the mouth of the branch to this coal, which must be of the Flag or a higher bed, but no evidence was discovered as to which one of them it is. A large area of these coals is available here, as the hills rise to a height of over 2000 feet.

On the left, just above the mouth of Buck Smith branch, is 6 inches of coal under 6 feet of shale, the bottom half of which is black, at altitude 1215. This seems to be the same as the 11 inches coal ⅛ mile up the branch, and illustrates the variability of roof and weathering of sandstone into shale.

At Paint Gap to Stinking creek, 21½ miles from Manchester, the altitude is (exactly) 1645.

The foregoing cover practically all coal openings on Goose creek waters open to inspection, but on the head of the Right fork of Stinking creek some 2 or 3 miles southeastward from Paint Gap, is a 15-yard entry into what is probably the Fire-clay coal, which gives promise of that bed being workable in Kentucky ridge, possibly on the Goose creek side, and casts some doubt upon the correlation of the Fire-clay coal, as given, where thin above Hun Jackson branch.

This (Stinking creek) entry 25 feet above the creek, belonging to Mrs. Taylor, has the following section as measured, the top at the face and the bottom at the mouth of the entry:

Fire-clay Coal (?).

Massive sandstone	15 ft.
Coal	31″
Shale	4″
Coal	10″
Knife-edge parting.	
Coal	13″
Altitude, 1430.	

In a second entry, 100 yards farther up the creek, the upper parting is reduced to 3 inches and the lower is wholly absent. Twelve feet below is 16 inches more coal.

So far as learned there is no other opening of the bed on the headwaters of the right fork of the creek.

There is, however, good reason for belief in continued thickness of the bed southward to the Left fork of Straight creek.

On that fork, some 2 miles southward from the entry last given, C. C. Knuckles has entries into the Fire-clay coal giving the following sections:

On Left.		On Right.	
Sandstone	20 ft.	Sandstone	15 ft.
Coal	42″	Shale with coal	4 ft.
Shale	2″	Coal	33″
Coal	10″	Shale	1″
Shale	1″	Coal	5″
Coal	4″	Knife-edge parting.	
		Coal	3″
		Knife-edge parting.	
		Coal	3″
		Shale	6″
		Coal	10″

Altitude, 1435.

The flint fire-clay was found here 3 to 6 inches below the bottom coal instead of in its usual place as a parting.

A mile westward from these entries, on the left of the branch giving the road from Straight to Stinking creek, Brit Slusher has a long entry into the same bed with the following section at its mouth:

Fire-clay Coal.	
Shale	1 ft.
Coal	32″
Shale	8″
Coal	8″

Altitude, 1485.

Kentucky Geological Survey

J. B. HOEING, STATE GEOLOGIST

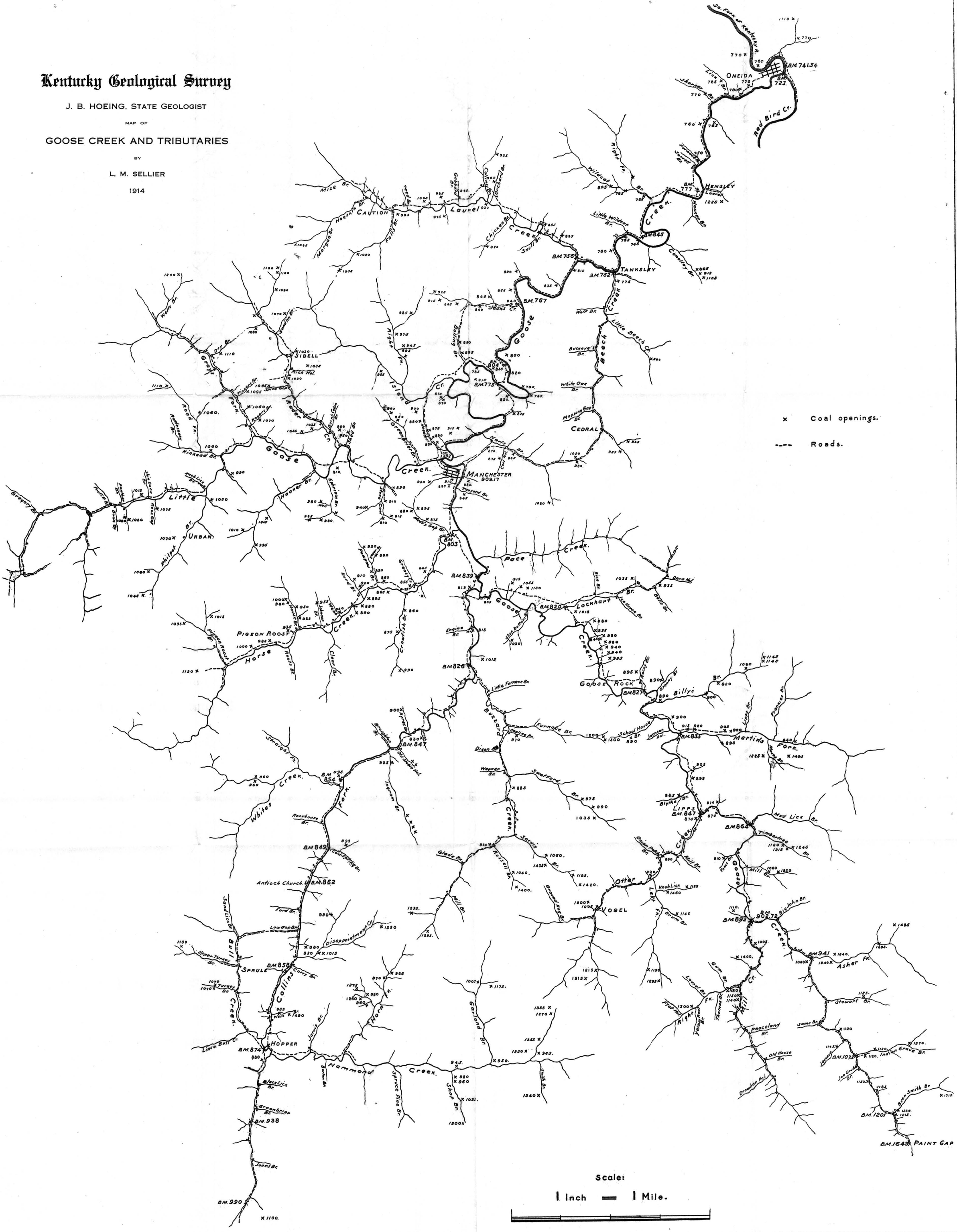
MAP OF

GOOSE CREEK AND TRIBUTARIES

BY

L. M. SELLIER

1914



× Coal openings.

---- Roads.

Scale:

1 Inch = 1 Mile.